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PROPOSED OPERATIONAL BASE SITE, ESCALANTE DESERT, BERYL AREA, U--ETC(U)
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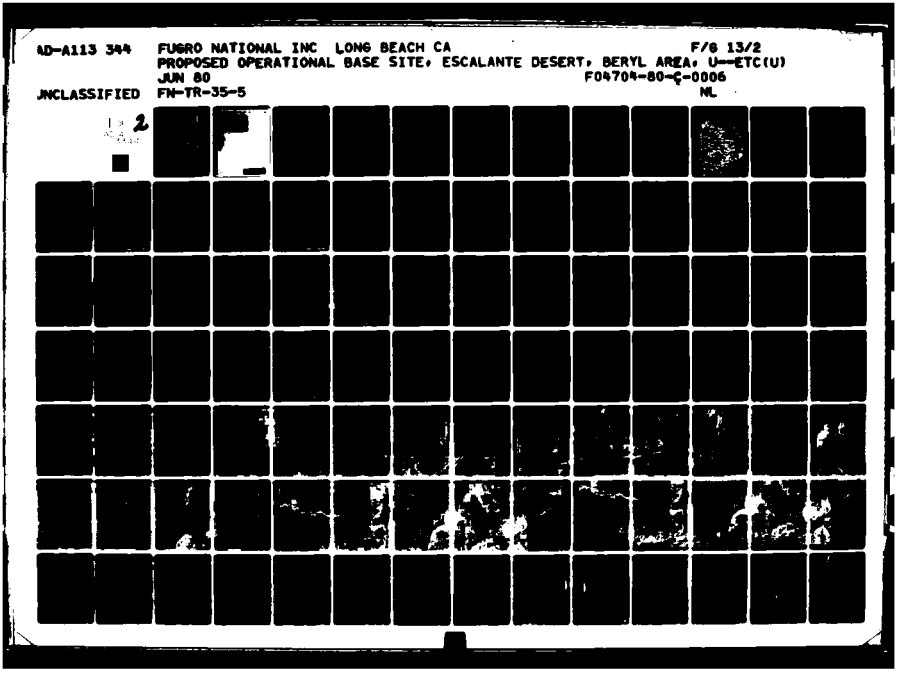

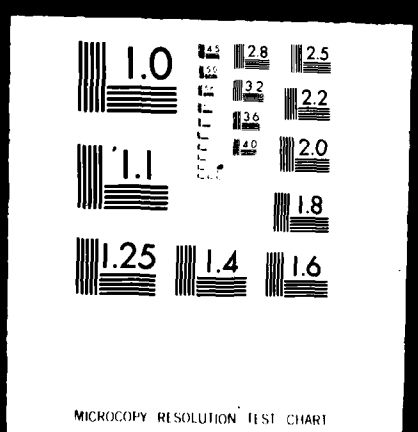

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PROPOSED OPERATIONAL BASE SITE

ESCALANTE DESERT

BERYL AREA, UTAH

Prepared for:

U.S. Department of the Air Force
Ballistic Missile Office (BMO)
Norton Air Force Base, California 924[illegible]

Prepared by:

Fugro National, Inc.
3777 Long Beach Boulevard
Long Beach, California 90807

13 June 1980

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report presents the results of a geotechnical study for a potential operating base site in the Escalante Desert near the community of Beryl, Utah. This report is in support of an operational base selection process in progress.

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1.0 INTRODUCTION

This report presents the results of a geotechnical study for a potential operating base site in the Escalante Desert near the community of Beryl, Utah. It is the fifth base report prepared by Fugro National, Inc. in support of an operational base selection process that is in progress. The background of this task is outlined in the following paragraphs.

In November 1979, Fugro National, Inc. (FNI) was tasked to conduct studies supporting the selection of an operational base location for the MX system in the Nevada-Utah siting area. The studies were to include information about water supply, land ownership, existing and proposed transportation systems, terrain, and geotechnical conditions. Using this information, FNI was to prepare conceptual layouts showing the operational base, designated assembly area, missile assembly buildings, and operational base test site.

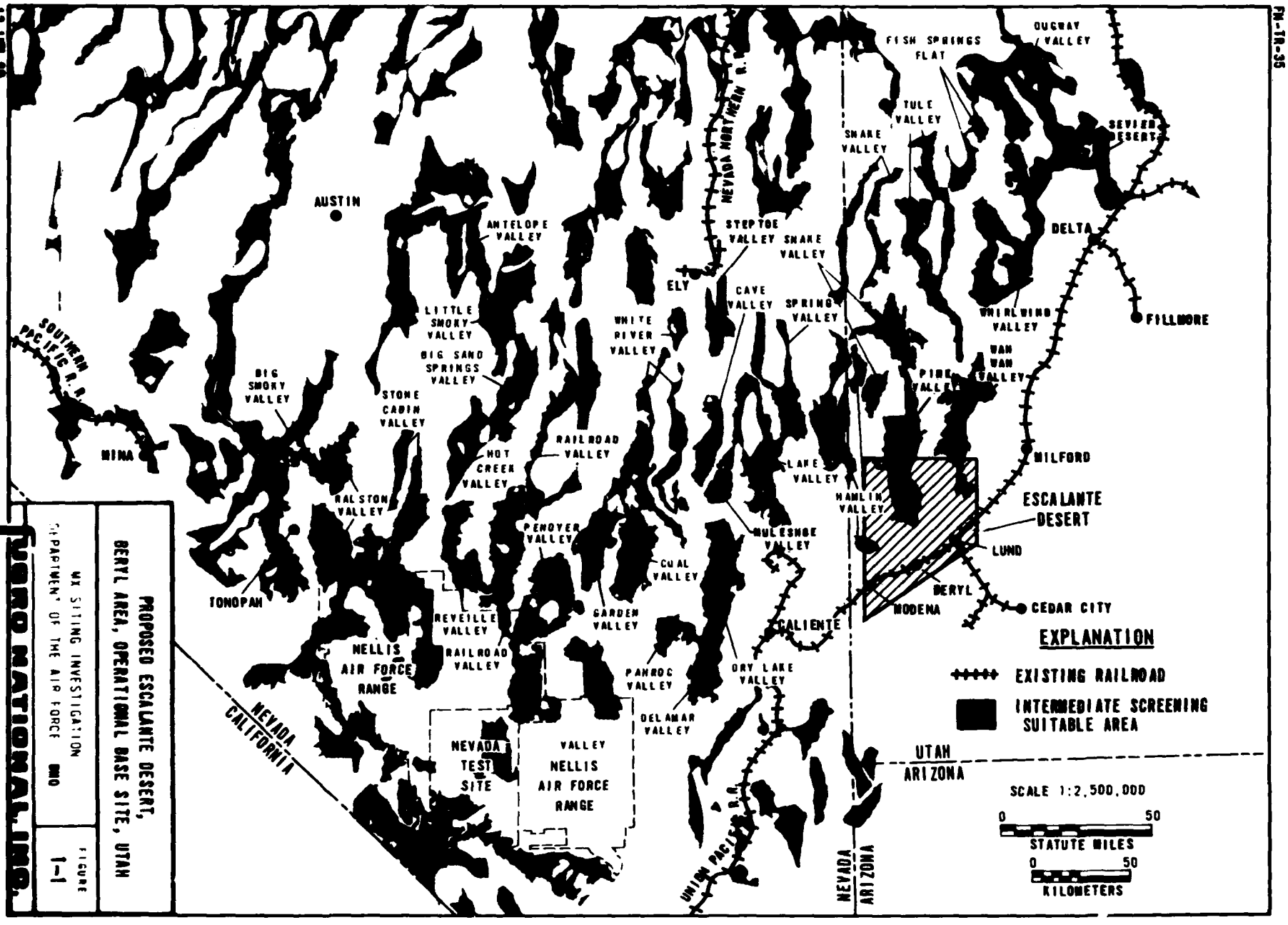
The original work statement specified that the Pahroc/Pahranagat, Ely, and Mina regions of Nevada, and the Delta region of Utah were to be studied. However, following the preparation of the original work statement, it was recognized that extensive study would be required before a final site selection could be made. It was decided, therefore, that FNI would begin by providing as much information as quickly as possible about a number of sites. In response, on 21 December 1979, FNI submitted a preliminary report titled "Initial Operating Base Report."

Eleven possible sites were identified in that report and various conceptual layout options were presented.

In January 1980, FNI was informed by BMO that Strategic Air Command's preference for an operational base was the Coyote Spring/Kane Springs area in Nevada. FNI therefore concentrated its continuing studies on this area. An interim report on Coyote Spring and Kane Springs valleys was submitted on 27 February 1980.

Subsequently, FNI was asked to study possible operational base locations in the Milford area of Escalante Desert, Utah, the Ely area of Steptoe Valley, Nevada, and the Delta area of Sevier Desert, Utah. Reports on the Milford, Ely, and Delta area sites were submitted to BMO on 10 March, 31 March, and 15 May 1980, respectively.

In May 1980, FNI was informed that the Strategic Air Command had completed an evaluation of potential operational base sites with a resulting preference for the Beryl area in Escalante Desert, Utah. FNI was requested to conduct a study of the Beryl area similar to those done for the other potential sites. At about the same time, BMO requested that new quantity-distance specifications be applied to the conceptual layouts for the missile assembly buildings and operational base test site. Similarly, changes were made in the operational base test site configuration based on a linear layout concept. Finally, FNI was asked to study the feasibility of siting the operational



PROPOSED ESCALANTE DESERT, BERYL AREA, OPERATIONAL BASE SITE, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE

FIGURE 1-1

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base test site in adjacent Pine Valley in an area where the terrain is unsuitable for a large array of shelters.

2.0 SCOPE

The potential operational base site in the Escalante Desert, Beryl area, Utah, was evaluated to determine its geographic, cultural, geotechnical, and geohydrologic conditions. Geographic and cultural conditions were compiled from Bureau of Land Management master title plats and available topographic maps from U.S. Geological Survey 7.5- or 15-minute sheets. Geotechnical conditions were evaluated by a review of geologic and hydrologic literature and maps and by interpretation of aerial photographs (1:25,000 and 1:63,360 scale). The evaluation of geotechnical conditions in adjacent southern Pine Valley was supplemented by the preliminary results of on-going Verification studies in that area.

This study was limited to the evaluation of the relative suitability of this area for an operational base site using subjective geotechnical criteria. It was conducted without benefit of large-scale topographic maps or field studies and does not attempt to determine specific road or railroad alignments, structure location or design, or construction cost estimates. Proposed options for operational base layouts are based on best estimates of the actual conditions on site.

3.0 OPERATIONAL BASE - GENERAL DESCRIPTION AND LAYOUT CRITERIA

3.1 OPERATIONAL BASE STRUCTURES

Conceptually, the operational base consists of three main activity centers; 1) the operational base proper, 2) the designated assembly area, and 3) the operational base test site (Figure 3-1). Each of these centers has an estimated size and, in some cases, a specified distance from other centers or structures.

The Operational Base (OB) consists of technical facilities supporting the MX system, housing, attendant support facilities, and a 10,000-foot runway. The area needed for these facilities is estimated to be about 5500 acres or 8.6 mi^2.

The Designated Assembly Area (DAA) consists of the production Missile Assembly Building (MAB), the maintenance Missile Assembly Building (MAB), and the DAA support facility. The DAA support facility is estimated to occupy 1280 acres or 2 mi^2. It will contain a munitions facility, missile stage storage area, special transport vehicle assembly area, cannister storage area, security area, and contractor support area. A quantity distance criterion of 2965 feet applies to both MAB structures, thus, no other structures are to be located within this distance from either structure. Another criterion is that the entire DDA site should be no less than 1 statute mile from the OB.

The Operational Base Test Site (OBTS) will consist of a Security Alert Facility (SAF) and a test cluster area. The test cluster

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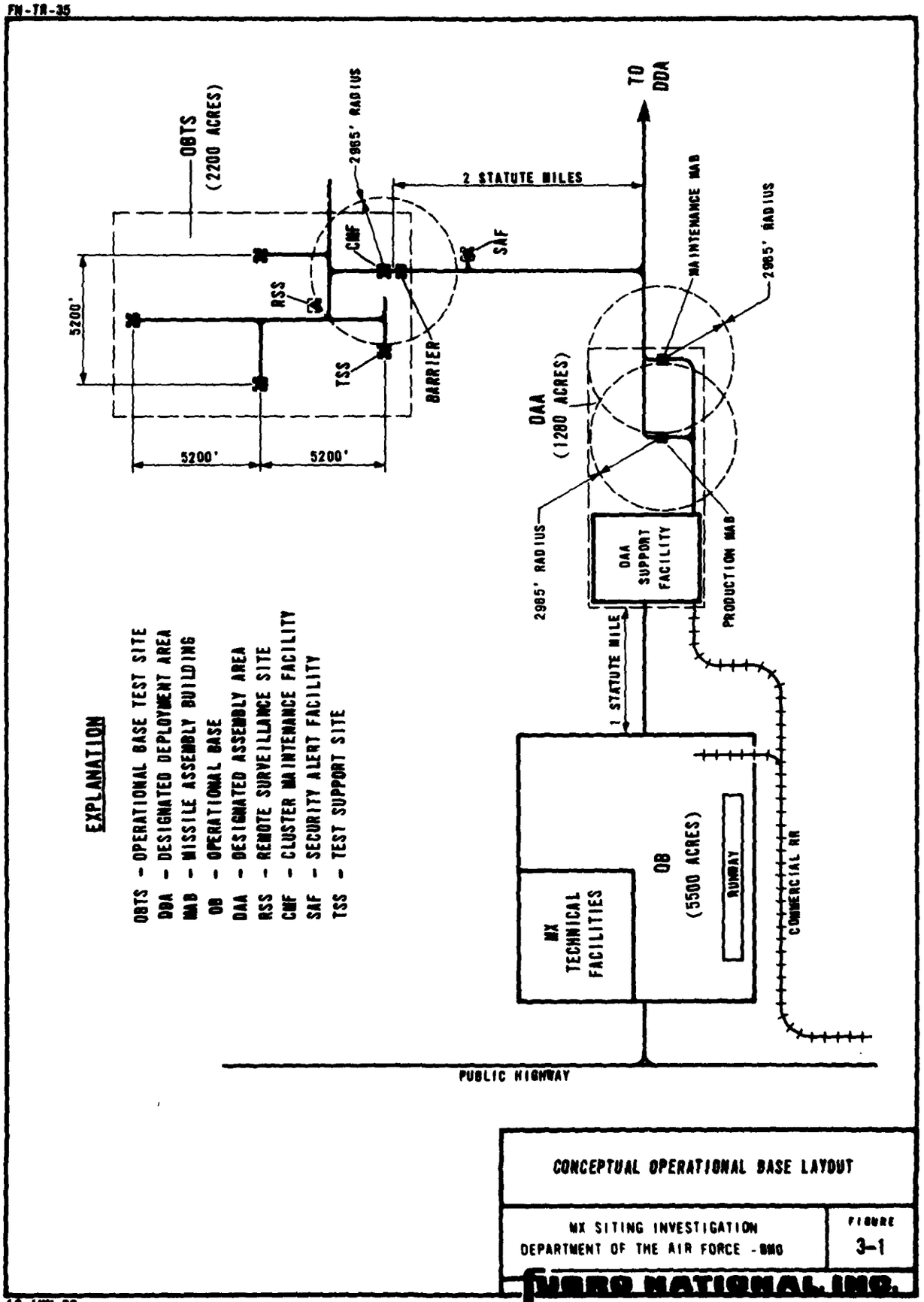

CONCEPTUAL OPERATIONAL BASE LAYOUT

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FIGURE
3-1

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13 JUN 80

area, which covers about 2200 acres (3.4 mi^2), will have;

1. a road barrier;
2. a Cluster Maintenance Facility, or CMF (situated at least 2965 feet from the nearest structure);
3. three shelters spaced 5200 feet apart (one of which will be used for Nuclear Harness and Surviability Tests);
4. a Test Support Site (TSS); and
5. a Remote Surveillance Site (RSS).

Recent discussions have suggested that there may be some misunderstandings regarding the criteria for the siting of the OBTS. The criteria used for this study are as follows:

- Depth to rock and water shall be greater than 50 feet;
- It is preferable that the site be located in a relatively isolated area;
- It is preferable that the site does not cause a loss of suitable area for shelter deployment;
- The site is to be located at least 2 statute miles from the Designated Transportation Network (DTN); and
- An area that has been excluded for shelter deployment because of unsuitable terrain is acceptable for OBTS siting provided the terrain is relatively flat and drainages are not excessive.

Should the stated criteria not be correct, some revisions in the proposed OBTS location may be required.

3.2 OPERATIONAL BASE AIRFIELD

The primary concerns in selecting an airfield site are the wind direction, the amount of unobstructed air space, and the flying conditions in the area.

The main runway should be oriented parallel to the predominant wind direction. Minor deviations in orientation are possible if there are problems because of terrain conditions or populated areas on the extended runway centerline. A crosswind runway should not be considered unless wind coverage on the primary runway is less than 90 percent, or when the beam wind component on the primary runway is 13 miles per hour during periods of restricted visibility. An extended meteorological study would be needed to determine these factors.

Airspace around an airfield should be free of obstructions to maintain a high level of safety. Criteria for ensuring unobstructed airspace have been developed by the Air Force (AFM 86-8) and the Federal Aviation Administration (FAR Vol XI), as shown in Figure 3-2 and discussed in the following paragraphs.

For both approach and departure, the unobstructed airspace begins 200 feet from the end of the paved runway. It rises at a slope of 50:1 for a horizontal distance of 25,000 feet at which point it is 500 feet above the runway. This unobstructed airspace continues at 500 feet above the runway for another 25,000 feet. At the same time, the approach/departure corridor widens to 16,000 feet at its ends. The total length of the approach and departure airspace is 20.9 miles.

The airspace on either side of the runway should also be unobstructed. Beginning at the edge of the runway, the unobstructed airspace rises at a slope of 7:1 for a horizontal distance of 1050 feet at which point it is 150 feet above the runway. This

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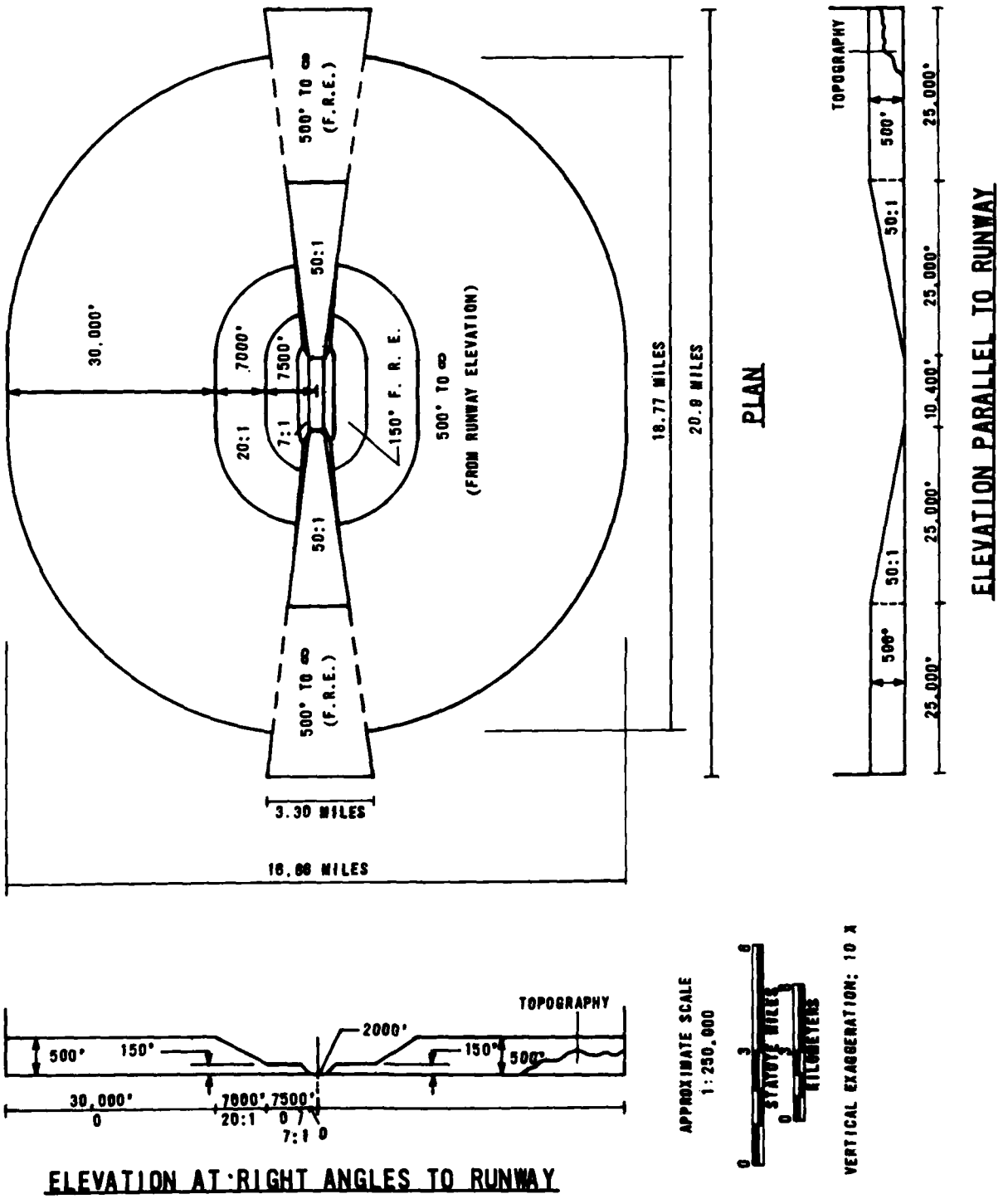

UNOBSTRUCTED AIRSPACE
10,000' PRIMARY INSTRUMENT RUNWAY

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE - BMO

FIGURE
3-2

TURNER NATIONAL INC.

13 JUN 80

elevation is maintained for another 5450 feet outward from the runway. At this point, the slope again rises at a ratio of 20:1 so that over the next 7000 feet, an elevation of 500 feet above the runway surface is reached. This 500-foot elevation is maintained for an additional 30,000 feet outward from the runway. This condition must exist completely around the runway except where the approach/departure airspace takes precedence.

No object (topographic or manmade) within 44,500 feet of the runway should be higher than 500 feet above the runway. The total width of the regional unobstructed airspace is approximately 17 miles.

The existing flying conditions in an area should also be evaluated. The impact on flight corridors, other airfields, and areas of military operation or restricted use should be determined.

The Federal Aviation Administration (FAA) is the responsible federal agency on this subject. All permit applications and follow-on studies (i.e., weather, wind, flight patterns, etc.) must go through the FAA, which, in turn, releases the results of this review as recommendations. The jurisdiction for permitting, airfield construction, and maintaining unobstructed airspace lies with the local government for each community.

3.3 TRANSPORTATION REQUIREMENTS

An operational base site must have the ability to be connected to a major highway and a major railroad while still being

accessible through the Designated Transportation Network (DTN) to the Designated Deployment Area (DDA). The highway and a rail spur will connect the OB with the DAA. Transportation from the DAA to the DDA and the OBTS will be along the DTN.

4.0 GEOGRAPHIC AND CULTURAL CONDITIONS

4.1 LOCATION

Escalante Desert is an irregularly shaped valley, generally trending northeast-southwest. It is approximately 88 miles long and 32 miles wide at the widest point. The valley is located in southwestern Utah (Figure 1-1). The northern half of the valley is in Beaver County and the majority of the southern half is in Iron County. The southwesternmost portion of the valley is in Washington County. The largest communities within the valley are Milford, Minersville, Cedar City, and Enterprise. Milford and Minersville are located in the northern portion of the valley and have populations of 1350 and 500, respectively (Beaver County Clerk, 1980).

In the southern portion of the valley, the largest town is Cedar City. Its population is estimated to be between 13,000 and 15,000 (Iron County Clerk, 1980). Within the southwestern portion of the valley, the largest community is Enterprise with an estimated population of about 1000 (Day, 1980). Other small communities in this area are Newcastle, Lund, Beryl Junction, Beryl, and Modena. These communities proper have populations generally less than 50; rural populations around some communities can be as high as 450.

The main highways in the valley are as follows:

- State Highway 21, which runs north-south from Milford to Minersville;
- State Highway 130, which runs north-south between Minersville and Cedar City (35 miles);

- State Highway 19, which trends northwest from Cedar City to Lund (33 miles);
- State Highway 56, traversing the southern portion of Escalante Desert between Cedar City, Utah, and Panaca, Nevada (81 miles); and
- State Highway 18, which connects Highway 56 at Beryl Junction with Enterprise (11 miles).

Additionally, a paved road connects Beryl Junction, on Highway 56, with Beryl, a distance of 13 miles.

The main route from Beryl to Las Vegas is via Beryl Junction, and southward along Highway 18 to Enterprise and St. George. From St. George (population 18 to 20,000; Washington County Clerk, 1980), the route to Las Vegas is along Interstate 15.

The Union Pacific Railroad runs along the northwestern side of the entire Escalante Desert. Both Beryl and Lund are situated adjacent to the railroad.

The Beryl study area occupies only a small portion of the total Escalante Desert. It is in the western portion of the valley in Iron County, northwest of the Union Pacific Railroad. The southern boundary of the area is the railroad and extends from Lund on the northeast to Modena on the southwest. The study area is bounded on the west by the Indian Peak Range and on the north by the North Peaks and Wah Wah mountains.

4.2 LAND STATUS

The study area, like the rest of Escalante Desert, consists primarily of state and private property (Drawing 4-1). The chief land use in the area is ranching; only about 340 acres

(.5 mi^2) are being farmed. Less than half of the area consists of public lands administered by the Bureau of Land Management (BLM) from their Cedar City District Office. Much of the public land may contain grazing rights.

Within the western Escalante Desert, but outside of the study area proper (Drawing 4-1), there exist two Known Geothermal Resource Areas (KGRA). These KGRAs total approximately 6400 acres (10 mi^2) (Utah Geologic and Mineral Survey, 1977). The majority of the valley and most of the study area have potentially valuable geothermal resources.

5.0 GEOTECHNICAL CONDITIONS

5.1 TERRAIN

The Beryl study area is located in the southern end of Escalante Desert (Drawing 5-1) in the Great Basin section of the Basin and Range physiographic province. This portion of Escalante Desert is a relatively flat alluvial basin which is almost completely surrounded by low-lying mountain ranges (6500 to 7500+ feet). The basin proper is rimmed by alluvial fans and contains lacustrine deposits in its center.

Alluvial fans are generally gently sloping (zero to five percent), although fans with slopes exceeding ten percent do occur high on the mountain flanks. Lacustrine deposits are almost flat (zero to one percent slopes). Several areas around the periphery of the valley have been delineated as having adverse terrain conditions. These are near the southern end of the Wah Wah Mountains and the northern end of the Antelope Range.

The valley floor, between the Union Pacific Railroad and Highway 56, contains some fairly broad and widespread eolian deposits (Drawing 5-1). The topography in portions of these areas is irregular and hummocky. Analyses of the dunal trends and forms indicate that they result from a S30°W prevailing wind.

In the west-central portion of the valley, near Modena, the valley floor contains a high density of stream channels up to 5 feet deep.

5.2 FAULTING

The study area is located within the Intermountain Seismic Belt delineated by Smith and Sbar (1974). The Intermountain Seismic Belt trends generally northward through western Utah and has been the locus of frequent small to moderate magnitude earthquakes in historic times. Geologic data suggest that much larger events are probable (Cook, 1971).

The Quaternary Fault Map of Utah (Anderson and Miller, 1979) shows several faults existing in the northeastern portion of the study area. They trend in a general north-northeasterly direction, with the southernmost fault trace ending near the Union Pacific railroad approximately 4 miles northeast of Zane, Utah (Drawing 5-1). The faults may continue to the south-southwest at depth, since the area in which they are no longer visible consists of younger alluvial sediments and dune deposits. Anderson and Miller (1979) consider the faults to be potentially active.

Several photo lineaments have been observed in the area southwest of the previously mentioned faults. Due to their general alignment with, and close proximity to, a known fault, the features may be fault-related. The southwesternmost extent of the photo linears is approximately 2 miles east of Zane, Utah. Other lineaments are visible on the aerial photographs to the east; these trend in a northwesterly direction and are again possibly fault related.

6.0 GROUND-WATER CONDITIONS

6.1 GENERAL HYDROLOGY

The Beryl, Utah area lies within the Escalante Desert portion of the Cedar Hydrologic Unit (Utah State University, 1963). Sandberg (1966) reported that valley-fill deposits constitute the only known aquifer within the area. The valley-fill deposits consist of interbedded gravel, sand, silt, and clay. Records compiled by the U.S. Geological Survey (1979) indicate that the depth to ground water is less than 50 feet west of Beryl but exceeds 200 feet along the valley margins at higher topographic elevations. The direction of ground-water movement is from the valley margins toward the center of the valley and north-west toward Lund (Sandberg, 1966). Utah Division of Water Resources (1979) reported water-level declines of less than 2 feet for the Beryl-Enterprise area during the period 1977 to 1978.

6.2 WATER AVAILABILITY

6.2.1 Perennial Yield

The precise perennial yield of ground water for the Escalante Desert is unknown. Eakin, Price, and Harrill (1976) have made a provisional estimate of 5000 to 25,000 acre-feet for it. Using the Hill method described by Todd (1959), a perennial yield of 35,000 acre-feet is estimated for the ground-water system in the Escalante Desert area (Table 6-1). This method consists of plotting the change in ground-water levels versus the average annual withdrawal. The perennial yield is then estimated to be

GROUND WATER AVAILABILITY (IN ACRE-FEE					
PERENNIAL [1] YIELD	PRESENT USE				SOURCE
35,000	70,650				ALLUVIAL VALLEY-FILL AQUIFER
	IRRIGATION	INDUSTRIAL	MUNICIPAL	DOMESTIC AND STOCK	
	69,600	0	300	750	

[1] PERENNIAL YIELD IS THE AMOUNT OF GROUND-WATER THAT CAN BE WITHDRAWN PER YEAR FROM A BASIN WIT

RE-FEET/YEAR)			POTENTIAL IMPACTS		
RCE	QUALITY		GROUND-WATER LEVELS	WATER QUALITY	SPRING DISCHARGE
VIAL T-FILL IFER	VARIABLE		ACCELERATED DECLINE	MAY INCREASE Ca, NO_3, AND SO_4	PROBABLY NO IMPACT
	POTABILITY	CONSTRUCTION POTENTIAL			
	VARIABLE, LOCALLY EXCEEDS CRITERIA FOR Ca, NO_3, SO_4, LOCALLY HARD.	GOOD			

SIN WITHOUT LOWERING CURRENT GROUND WATER LEVELS.

SUMMARY OF GROUND-WATER CONDITIONS IN ESCALANTE DESERT, BERYL AREA, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE 6-1

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the annual pumpage which would result in no ground-water level change.

6.2.2 Present Ground Water Use

According to the Utah Division of Water Resources (1978), ground-water usage in the Beryl-Enterprise area averaged 79,000 acre-feet per year for the 15-year period from 1963 to 1977. Ground-water withdrawals for some years were as high as 93,000 acre-feet; however, withdrawals for 1978 totaled only 70,650 acre-feet. Of that amount, about 69,600 acre-feet were used for irrigation, 750 acre-feet were used for domestic and stock use, and 300 acre-feet were used for municipal purposes.

6.3 WATER QUALITY LIMITATIONS

According to Sandberg (1966), ground water in the Beryl area is either fresh or slightly saline with the best quality ground water located in the southern part of the area. The poorest quality water occurs 1 to 3 miles south of Beryl where pumpage is the highest. Of 13 ground-water analyses reported by Sandberg, six exceeded the U.S. Environmental Protection Agency (EPA, 1976) quality criterion for nitrate (10 mg/l), four samples exceeded the EPA criterion for sulfate (400 mg/l), and two samples exceeded the criterion for calcium (200 mg/l). Four of the ground-water samples were hard, that is, they contained greater than 150 mg/l of calcium carbonate ($CaCO_3$).

6.4 IMPACT OF WITHDRAWAL

The existing withdrawals of ground water in the Beryl area greatly exceed the estimated perennial yield. Most of the

ground-water withdrawal and the corresponding water-level decline occurs in the Enterprise area. Areas of significant decline, however, comprise less than one-fourth of the valley.

The Utah State Engineer's Office has indicated that no additional ground-water withdrawals will be allowed in the Beryl area (Hansen, 1980). If, however, additional ground-water development were permitted, such development would probably be most feasible in the northeastern, northern, and western parts of the Beryl area according to Sandberg (1966).

If additional ground water is developed for an operational base, it is likely that the current rate of water-level declines would be accelerated. It may be possible, however, to obtain an operational base water supply through the purchase or lease of existing ground-water rights. This would avoid a significant increase in water-level declines.

It should be noted that water rights and land ownership are separate entities under Utah law, and ownership of the land does not guarantee ownership of the water rights. Any purchase of water rights will require permission of the Utah State Engineers Office. If existing irrigation water rights are purchased and irrigated land is retired from agriculture, it is likely that the concentrations of total dissolved solids and nitrates in the ground water will diminish slightly since the leaching action of irrigation water and the use of fertilizers will decrease.

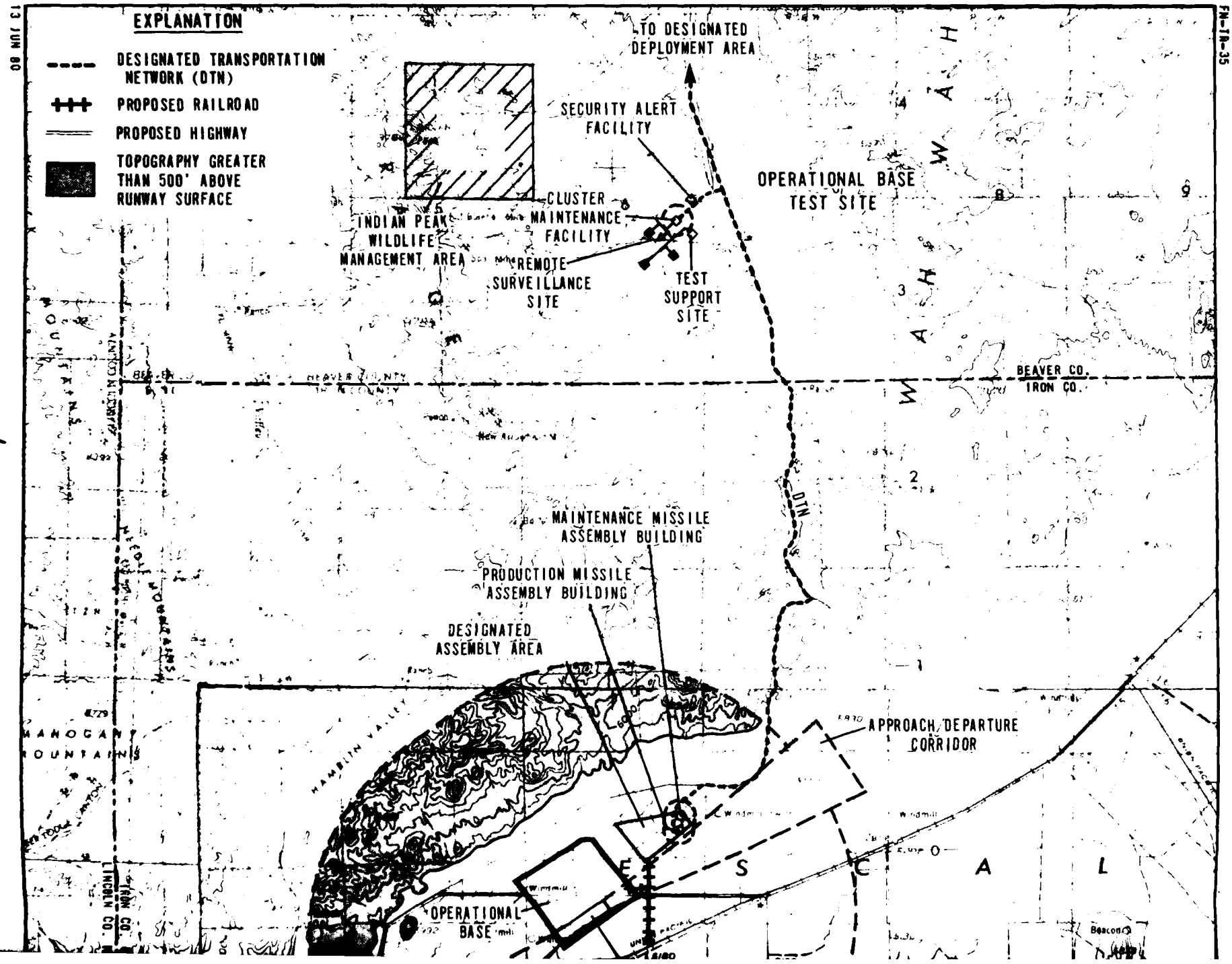
7.0 OPERATIONAL BASE LAYOUT AND TRANSPORTATION CONSIDERATIONS

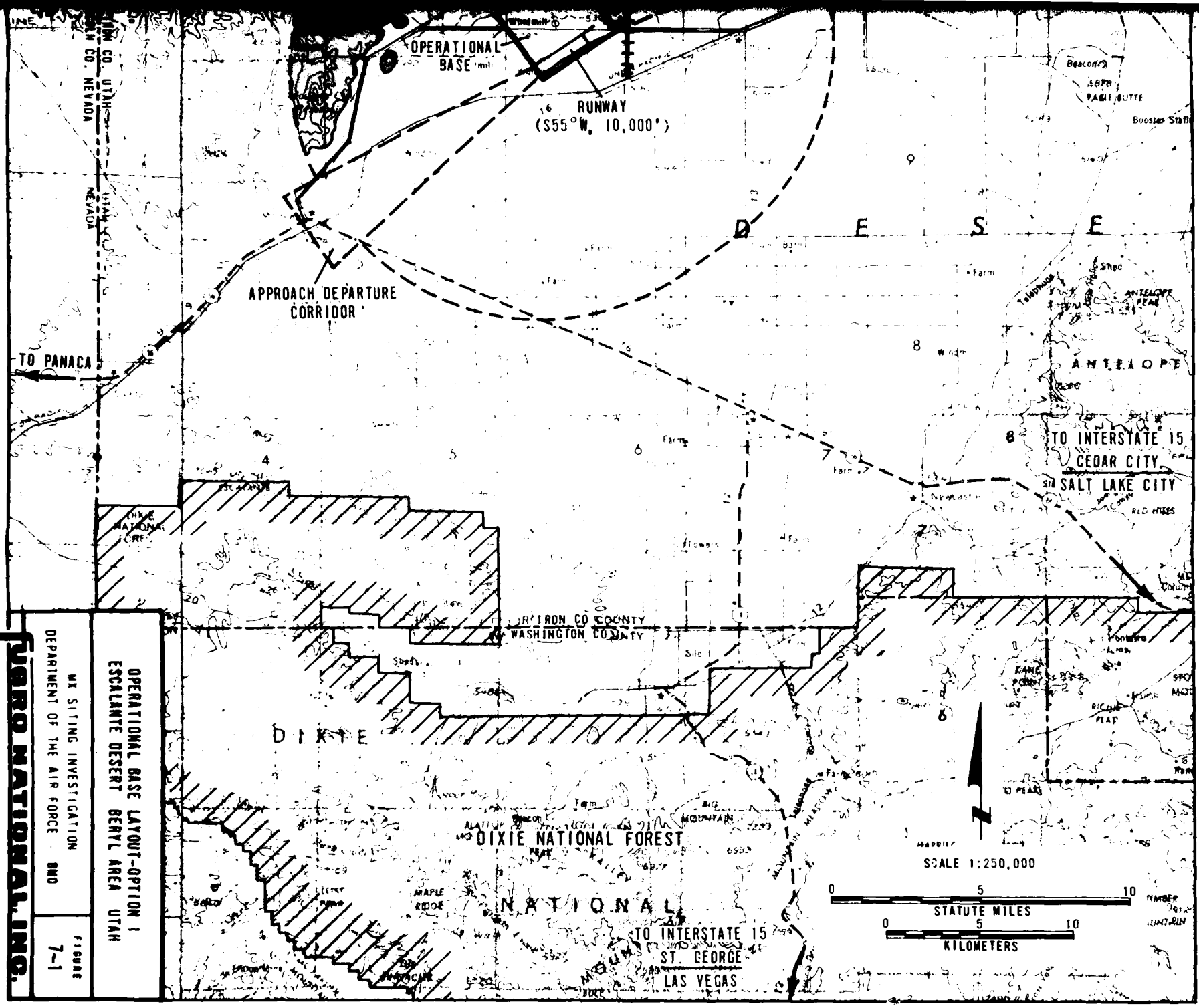
7.1 POSSIBLE LOCATIONS FOR THE OPERATIONAL BASE AND AIRFIELD (OPTIONS 1 and 2)

Two possible OB configurations have been developed for the Beryl area. These configurations (Figures 7-1 and 7-2) are based on the data presented in the previous sections of this report. Because of site conditions discussed below, the location of the OB proper is relatively inflexible. Hence, generally the same OB location was used for both configurations. The OB location is controlled by 1) the unobstructed approach and departure airspace needed for an airfield, and 2) the availability of a 5500-acre parcel (preferably on BLM land).

There is no location within the study area where an airfield can be sited so as to have the desired 17 miles by 20.9 miles of entirely unobstructed airspace. There is, however, a zone along the northern side of the railroad where at least the approach/departure criteria can be met (as in Figure 7-1). If an approach/departure is desired which better conforms to the S30°W prevailing wind (Section 5.1), the runway would need to be south of the railroad (as in Figure 7-2).

Within the zone where the approach/departure criteria are met, there are no large areas of contiguous BLM land. Those parcels of BLM land that do exist are generally also areas of dunes and windblown deposits (Section 5.1). In order to obtain sufficient land (5500 acres) to contain the OB, private and or state property must be used.


EXPLANATION
DESIGNATED TRANSPORTATION NETWORK (DTN)
PROPOSED RAILROAD
PROPOSED HIGHWAY
TOPOGRAPHY GREATER THAN 500' ABOVE RUNWAY SURFACE
TO DESIGNATED DEPLOYMENT AREA
SECURITY ALERT FACILITY
OPERATIONAL BASE TEST SITE
CLUSTER MAINTENANCE FACILITY
INDIAN PEAK WILDLIFE MANAGEMENT AREA
REMOTE SURVEILLANCE SITE
TEST SUPPORT SITE
BEAVER CO.
IRON CO.
MAINTENANCE MISSILE ASSEMBLY BUILDING
PRODUCTION MISSILE ASSEMBLY BUILDING
DESIGNATED ASSEMBLY AREA
APPROACH/DEPARTURE CORRIDOR
OPERATIONAL BASE
LINCOLN CO.
MANOGANY MOUNTAIN
HAMLIN VALLEY
DTN
WASHINGTON
SCALE



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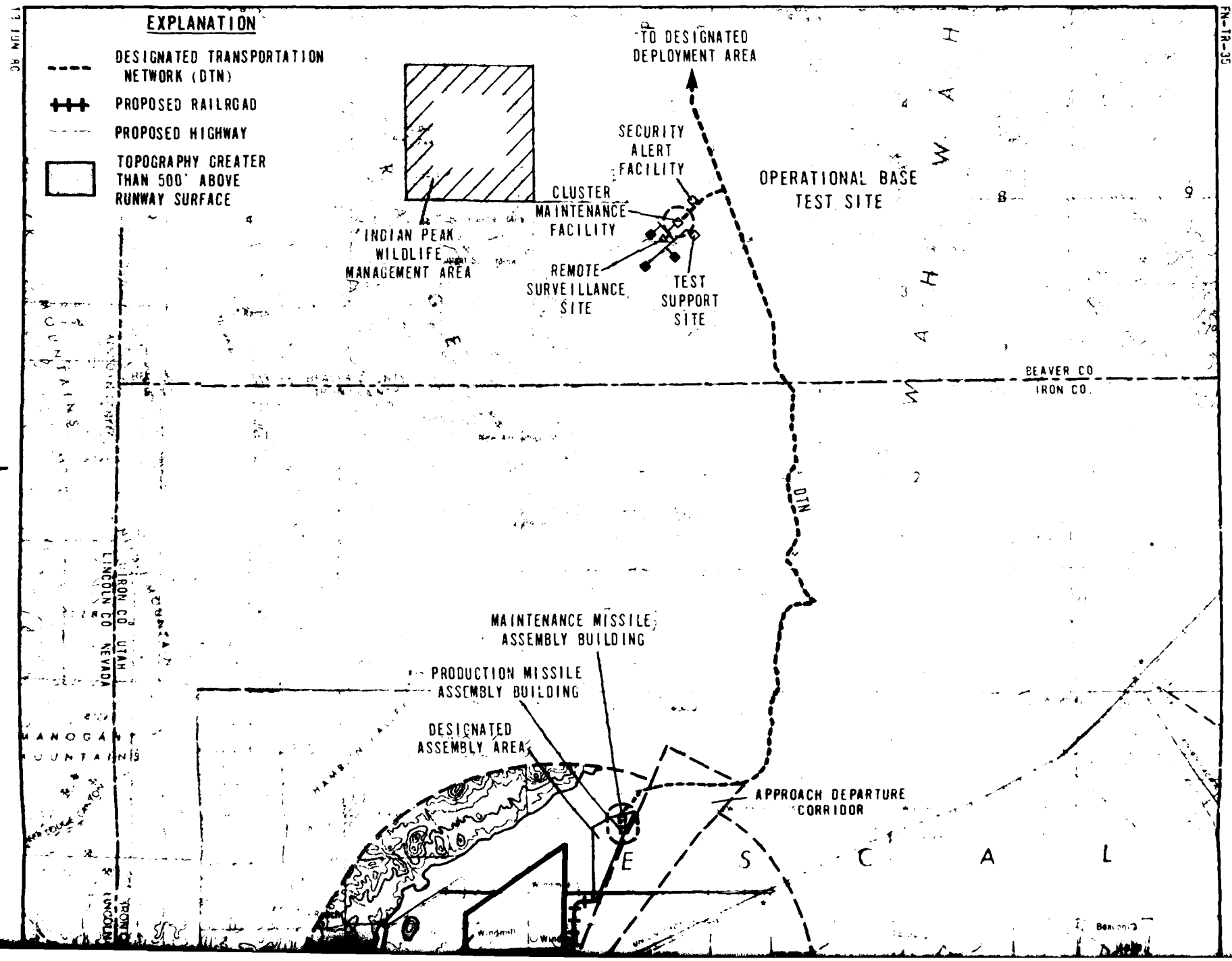
OPERATIONAL BASE LAYOUT-OPTION 1 ESCALANTE DESERT BERYL AREA UTAH	FIGURE 7-1
MX SITING INVESTIGATION DEPARTMENT OF THE AIR FORCE - BMO	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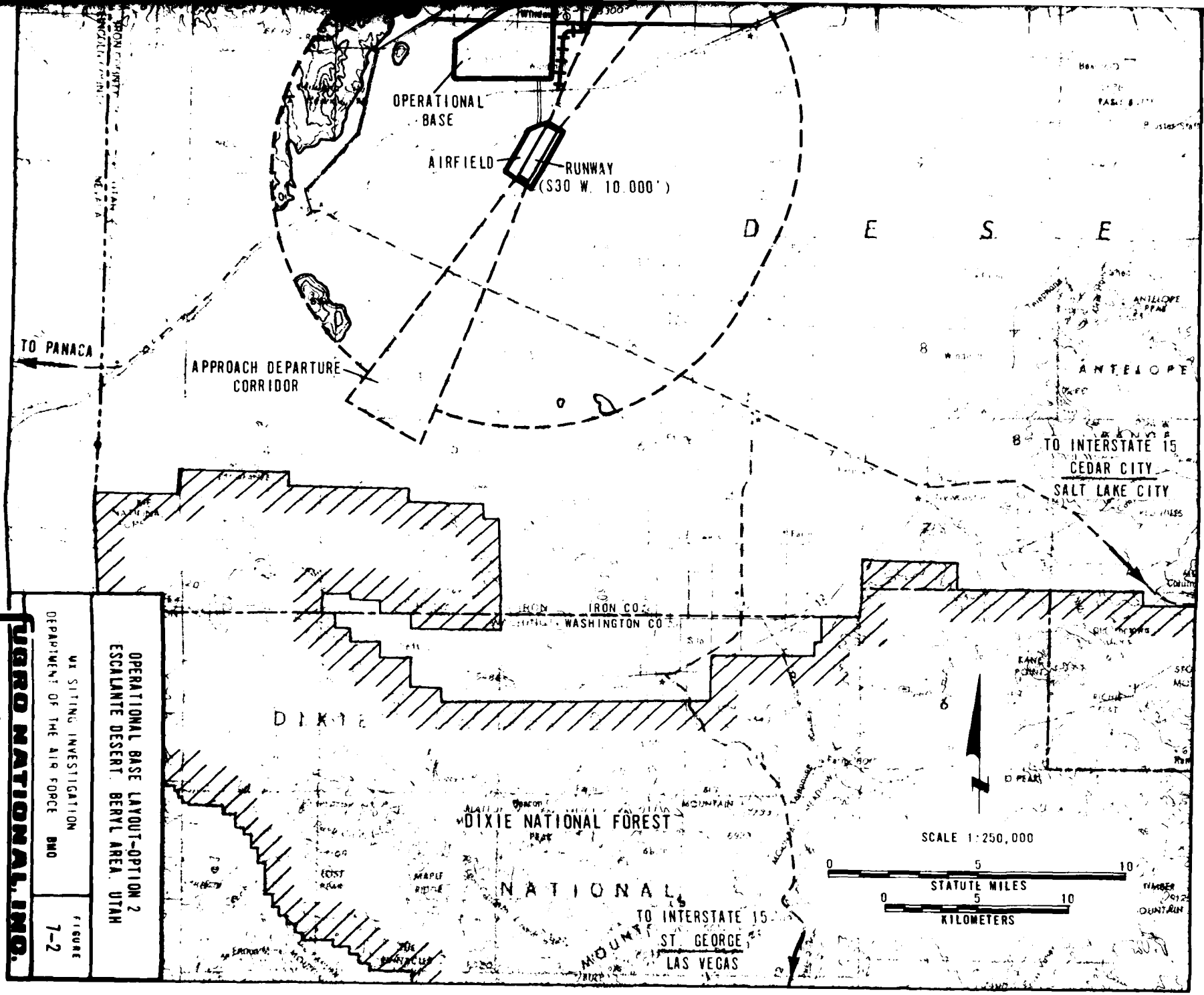

OPERATIONAL BASE LAYOUT-OPTION 2
ESCALANTE DESERT, BERYL AREA, UTAH

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

FIGURE 7-2

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The site depicted as Option 1 (Figure 7-1 and Drawing 7-1) includes 4100 acres (6.4 mi^2) of private property and 640 acres (1 mi^2) of state land. The OB site is positioned as far west of the dune areas as the approach/departure criteria of the runway will permit. The northern limit of the site is approximately 1 mile south of the proposed Intermountain Power Project (IPP) 500 KVDC transmission line. As shown in Option 1, the DAA is 1 mile from the OB. All activities are north of the railroad, thus minimizing the distance to the DDA and reducing the need for railroad crossings.

Option 2 (Figure 7-2) represents that condition where the approach/departure corridor is aligned with the prevailing wind (i.e., $S30^0W$) and the airfield is south of the railroad. The OB is located west of the previously mentioned dunes. The airfield location, separated from the OB by 1.25 miles, occupies 800 acres (1.25 mi^2) of BLM land. Depending on the area needed to house aircraft maintenance facilities and other activities, private property may need to be used. The OB and DAA of Option 2 are farther west than those of Option 1 so as not to be under the approach/departure corridor. The OB site depicted in Option 2 includes 4650 acres (7.25 mi^2) of private property and 800 acres (1.25 mi^2) of state land. It is approximately 1 mile south of the proposed IPP transmission lines.

Although not depicted here, a third layout option is possible. This option would have the OB and the runway combined south of the railroad and the DAA situated north of the railroad. The

area for the OB site in this configuration is privately owned except for the previously mentioned BLM land near the runway. Distances to many population centers would be shorter than for Options 1 and 2, and the DTN length would be the same. One disadvantage to this option would be the high volume of traffic crossing the railroad, however, this problem exists in any event as it pertains to access to the OB.

7.2 OPERATIONAL BASE TEST SITE LOCATION

The location shown for the OBTS in Figures 7-1 and 7-2 is one of four areas that meet at least one of the two main criteria for such a site (Section 3.1). The criteria are that a site should 1) be relatively isolated, and 2) have the same geotechnical characteristics as the proposed DDA.

Two such areas which appear to be geotechnically similar to the DDA are located just north of the Union Pacific Railroad. The first area (A on Drawing 7-1) is 8 and 9 miles east of Option 1 and 2 OBs, respectively. This area is only 0.5 to 1 mile north of the railroad and is on private property. The second area (marked B on Drawing 7-1) is 34 to 36 miles east of the OBs. An OBTS was located in this site during the Milford area OB study (FN-TR-35). This site has the most contiguous block of BLM land of the four possible OBTS locations and it is the most isolated site within that study area. As with site A, this location is very close (5.5 miles) to the railroad. Two other possible sites from the Milford OB study were considered but were rejected because they would result in a loss of a DDA or they lacked sufficient area.

A third area (C on Drawing 7-1) is in the southern portion of Hamlin Valley. This site consists of private property but is generally isolated from public activity. The site is about 30 miles northwest of the OB. Although not verified, it appears to be geotechnically similar to the deployment area. The main difference between this site and the other three is its excessive distance from the DDA (the other three OBTS sites are along routes that are more logical for the DTN).

The fourth area (D) is in the southern portion of Pine Valley, 26.5 to 29 miles north of the MABs for Options 1 and 2, respectively. Portions of the site are on private and state property. This is a relatively isolated area 12 miles southwest of the proposed Pine Grove Association mine and 4.5 miles southeast of the Indian Peak Wildlife Management Area. It is also two miles south and west of both the suitable area in Pine Valley and the proposed DTN (Pine Valley Road). Site D is in an area that was deemed unsuitable for shelter deployment due to adverse terrain. However, interpretation of airphotos suggests that this location may prove to be useable for the OBTS with a minimum of grading. On-going Verification field studies will resolve whether this site is geotechnically charactertistic of the deployment area. Because of isolated outcrops of rock in the vicinity, the possibility exists that the site is underlain by shallow rock. If this is the case, another investigation for a site in Pine Valley or one of the other areas mentioned will be necessary. Another site in Pine Valley will probably be more expensive than D, due to increased grading during site preparation.

7.3 DESIGNATED TRANSPORATION NETWORK CONSIDERATIONS

The DTN must connect the MABs with the OBTS and the DDA. Although two OB configurations are being presented, the location of the MABs in relationship to the DDA is the same for both (i.e., in the eastern portion of the study area south of Pine Valley). The DTN via OBTS sites A and D (Drawing 7-1) would enter the DDA through Pine Valley. The DTN to OBTS area B enters the DDA in Wah Wah Valley while the DTN to site C would be in Hamlin Valley.

The DTN into Pine Valley runs transverse to the North Peaks and along Broken Ridge in the Wah Wah Mountains. The grade along this route is as high as five to six percent over some areas. The route then converges with Pine Valley Road which crosses the mountains near Mountain Spring Wash. This pass should present only moderate construction problems because of an estimated grade of two percent.

A DTN into Wah Wah Valley must pass through Wah Wah Wash. This alignment should present only normal construction problems except for some areas of adverse terrain at its southern end. The grade is estimated at about two percent.

Hamlin Valley can be entered along Modena Draw. A gravel road exists and shou'd have an acceptable grade.

The Beryl Area offers good access into the proposed deployment area. The three access points just discussed provide easy and quick connections to the north and thus to the east-west routes.

Although only one of the three routes may be needed initially, others may become necessary later. This assumes that little, if any, use will be made of existing highways. Highways do exist that could be used if shorter travel times are needed. U.S. Highway 56 offers good access to the west although one must travel through at least two communities.

7.4 GROUND TRANSPORTATION CONSIDERATIONS

With the possible operational base locations selected, the problem of providing ground transportation to the site needs to be considered. Each of the possible OB locations is adjacent to the Union Pacific Railroad which provides easy access by short rail spurs to the OB and DDA. The Union Pacific Railroad is built with 130 lb/yd rail, which should handle moderate to heavy freight loads.

The remaining mode of transportation which needs to be considered is the highway. With the potential OB sites so near each other, the destination points to which highways are needed are the same for both. These points are 1) Beryl Junction from which there is easy access south to Enterprise, St. George, and Las Vegas, and east to Cedar City and Salt Lake City, 2) Modena and west to Panaca, Nevada and the western portion of the proposed DDA, and 3) Milford/Minersville and north to the eastern portion of the proposed DDA as well as Salt Lake City. The distances from each of these population centers to the various OB locations are summarized in Table 7-1.

Option (1)	RAILROAD		HIGHWAY				DESIGI	
	from Union Pacific to OB (2)	From OB to DAA	From Population Center to OB (4) (with alternates)			From OB to DAA	From DAA	
			BERYL (5) JUNCTION	MODENA	MILFORD		to Maintenance MAB	to Produ MAI
1	2.5 (3)	2	17.2 (13.3)	11 (9.2)	(58) 53	1	0.56(6)	0.5
2	0.25	3	19.8 (13.3)	10 (7)	61.5 (56.5)	1	0.56	0.5

NOTES:

(1) See Text and Figures 7-1 and 7-2.

(2) See Figure 3-1 for Abbreviations.

(3) Distances given are in Statute Miles.

(4) Option 2 OB is 1.25 Miles North of Runway.

(5) Beryl Junction is 36 Miles from Cedar City.
11 Miles from Enterprise.
47 Miles from St. George.

(6) .56 Mile Represents the 2965-Foot Stand Off Distance in Miles.

DESIGNATED TRANSPORTATION NETWORK (DTN)				DTN HIGHWAY		Straight Line From Maintenance MAB to Production MAB
DAA to Production MAB	From Maintenance MAB to OBTS	From Production MAB to DDA	From OBTS to DAA	From OBTS to OB	From OB to DDA	
0.56	26.5	26.6	27.1	29.5	29	0.56
0.56	29	29.1	29.6	32.5	32	0.56

DISTANCES BETWEEN OPERATIONAL BASE COMPONENTS
ESCALANTE DESERT, BERYL AREA, UTAH.

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE 7-1

FUGRO NATIONAL, INC.

There should be no more than standard construction problems along any of the needed alignments including the railroad and drainage crossings. The need for overpasses or underpasses at railroad crossings will need to be investigated. Also, the rights-of-way would have to be obtained, especially if alignments are not along existing gravel roads.

A gravel road exists from the OB sites to Beryl, after which there is a paved road to Beryl Junction. Both of these roads will need to be upgraded. An alternative to the existing road would be to build a straight-line road between the OB and Beryl Junction. This route would shorten the distance by 4 and 6 miles for Options 1 and 2, respectively. Another alternative is to build a straight-line road from Beryl to Cedar City, shortening the distance by 8 miles.

The gravel road from the OB to Beryl also extends west to Modena. This road would also need to be upgraded and could also be straightened. A straight route would lessen the distance by 1.75 miles and 3 miles for Options 1 and 2, respectively.

There are no paved roads between the OB sites and Milford. Numerous gravel roads exist and could be upgraded to highways on either side of the railroad. As an alternative, a new road could be constructed parallel to the railroad. Such a road would provide the most direct and realistic route to Milford and Minersville.

7.5 AIRSPACE CONSIDERATIONS

The two airfield locations shown in Figures 7-1 and 7-2 have been selected based on the airspace criteria presented in Section 3.2 and on the possible OB locations previously discussed.

All topography within the unobstructed approach and departure airspace for these airfields meets the criterion of being less than 500 feet above the runway surfaces. The topography at right angles to the airfields, however, does not meet the criteria for regional unobstructed airspace. Within the areas that should be unobstructed, there are the North Peaks, the southern extension of the Indian Peak Range, the mountains 2 miles south of Modena (marked X on Drawing 7-1) and the mountains 4 miles west of Beryl Junction (Y on Drawing 7-1). The extent to which each of these ranges deviates from the regional unobstructed airspace criteria is presented in Table 7-2.

Airspace use in the study area seems to be somewhat controlled. The OB sites are in the northeastern corner of the Desert Military Operations Area (MOA). The MOA is not restricted airspace but requires prior coordination with the appropriate range control for civilian and other users. Military aircraft use the airspace from 100 feet above ground level to, but not including, 1800 feet during daylight hours, Monday through Friday, for activities associated with the Nellis Air Force Range. Another area of activity is the Sevier "B" MOA, 44 miles to the north, used by the Dugway Proving Ground and the Utah Test and Training Range. This MOA should not affect the airspace. There are

MOUNTAIN RANGE	NORTH PEAKS		INDIAN PEAK RANGE		"X" MOUN
AIRFIELD OPTION (1)	1	2	1	2	1
MAXIMUM ELEVATIONS WITHIN REGIONAL UNOBSTRUCTED AIRSPACE	5710 TO 7222 FEET	NO IMPACT	5737 TO 8170 FEET	5737 TO 7260 FEET	NO IMPACT
HEIGHT OF RANGE IN EXCESS OF UNOBSTRUCTED AIRSPACE CRITERIA	1522 FEET	NO IMPACT	2470 FEET	1560 FEET	NO IMPACT
CLOSEST PEAK TO RUNWAY; HEIGHT IN EXCESS OF UNOBSTRUCTED AIRSPACE CRITERIA AND PROXIMITY TO RUNWAY	316 FEET / 5.5 MILES	NO IMPACT	430 FEET / 4.5 MILES	220 FEET / 5.5 MILES	NO IMPACT

NOTE: (1) RUNWAY ELEVATIONS ARE AS FOLLOWS:

OPTION 1 - 5200 FEET

OPTION 2 - 5200 FEET

(2) X - MOUNTAIN TWO MILES SOUTH OF MODENA.

(3) Y - MOUNTAIN FOUR MILES WEST OF BERYL JUNCTION.

	INDIAN PEAK RANGE		"X" MOUNTAIN[2]		"Y" MOUNTAIN[3]	
	1	2	1	2	1	2
PACT	5737 TO 8170 FEET	5737 TO 7260 FEET	NO IMPACT	6162 TO 6446 FEET	NO IMPACT	5801 TO 5880 FEET
PACT	2470 FEET	1560 FEET	NO IMPACT	746 FEET	NO IMPACT	180 FEET
PACT	430 FEET / 4.5 MILES	220 FEET / 5.5 MILES	NO IMPACT	462 FEET / 7.5 MILES	NO IMPACT	101 FEET / 7.5 MILES

MOUNTAIN RANGES IMPACTING ON
REGIONAL UNOBSTRUCTED AIRSPACE
ESCALANTE DESERT, BERYL AREA, UTAH.

MX SITING INVESTIGATION
DEPARTMENT OF THE AIR FORCE BMO

TABLE 7-2

FUGRO NATIONAL, INC.

local landing strips, such as the ones at Milford, Cedar City, and Beryl Junction, but they also should not pose a problem. A small strip at Modena may need to be investigated. The Escalante Desert is also an air corridor between Los Angeles-Las Vegas and Salt Lake City; potential conflicts between this corridor and OB operations will need to be assessed.

8.0 CONCLUSIONS

Based on the preceding discussions, the following preliminary conclusions are presented regarding the suitability of the Beryl study area for an operational base site:

- In general, the Beryl area has sufficient area for the lay-out of the operational base and its components. This area becomes limited by geotechnical and airfield considerations to one option in the western portion of the study area. A second option would place the airfield south of the railroad to conform to the prevailing wind direction. It was not possible to site either option entirely on BLM land. Final configurations can only be developed after all trade-offs have been considered.

- There are some areas of adverse terrain and possible flooding within the study area, but these can be avoided or mitigated. Additionally, there are potentially active faults in the northeastern portion of the study area. There are potential fault-related features in the vicinity of the study area; these were detected on aerial photos and will need further study to verify their existence. It is expected that problems associated with faults can be mitigated by using appropriate seismic design.

- Although variable in quality, the ground water in the Escalante Desert, and especially in the Beryl area, is generally suitable for use during OB construction and operation. The quantity of existing ground water needs further evaluation, but it appears that the area is being overused and that purchase of water rights from existing users may be the only source of an OB water supply.

- It is not possible to site an OB that fully complies with the guidelines for regional unobstructed airspace. The area of obstructed airspace is limited to the northwest for Option 1. If conditions warrant the use of the Option 2 configuration, additional obstructed airspace will occur to the southwest and southeast.

- Four potential sites for the OBTS were discussed including a site in Pine Valley. One or more sites may not be suitable because of misunderstandings regarding siting criteria. The need for further study will depend on what siting criteria is adopted as final.

- The Beryl area offers good access to the DDA by construction of the DTN through either Pine, Wah Wah, or Hamlin valleys and by the existing highway into other valleys of

the DDA. Transporatation, especially highway, and local community impacts should be considered before final site selection is made.

METRIC CONVERSION FACTORS

Because of the large number of distance figures presented in this report, it was thought that presentation of metric equivalents within the text would result in cumbersome reading. Therefore, the metric conversions are presented below for convenience.

1 foot = 0.3048 meters
1 mile = 1.6093 kilometers
1 acre = 0.4047 hectares
1 mile^2 = 259 hectares or 2.59 km^2
1 acre foot = 1233 meters^3

LIST OF ABBREVIATIONS

AFM	Air Force Manual
ASL	Above Sea Level
BLM	Bureau of Land Management
BMO	Ballistics Missile Office
CMF	Cluster Maintenance Facility
DAA	Designated Assembly Area
DDA	Designated Deployment Area
DTN	Designated Transportation Network
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
IPP	Intermountain Power Project
MAB	Missile Assembly Building
MOA	Military Operation Area
OB	Operational Base
OBTS	Operational Base Test Site
RSS	Remote Surveillance Site
SAF	Security Alert Facility
TSS	Test Support Site

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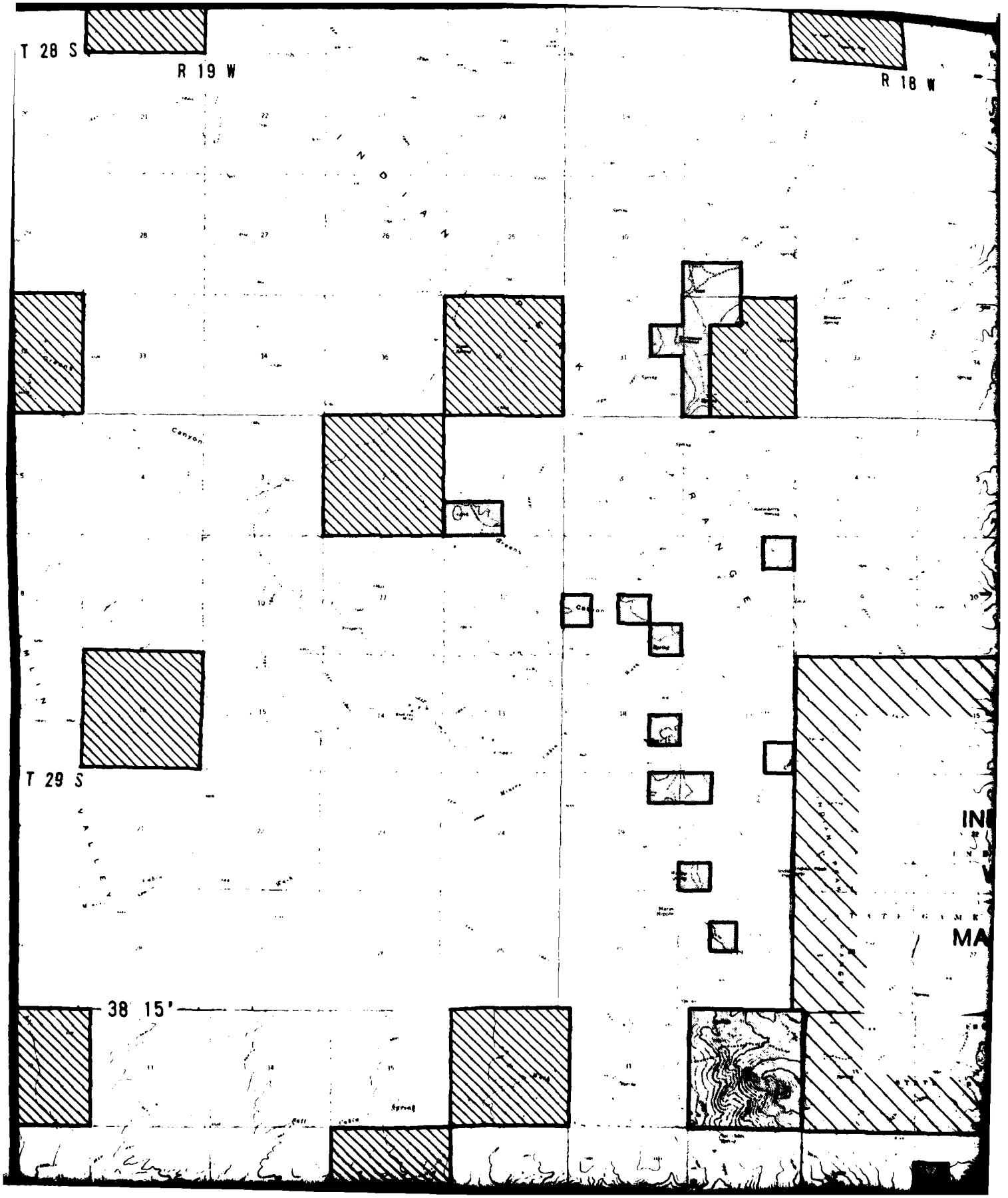
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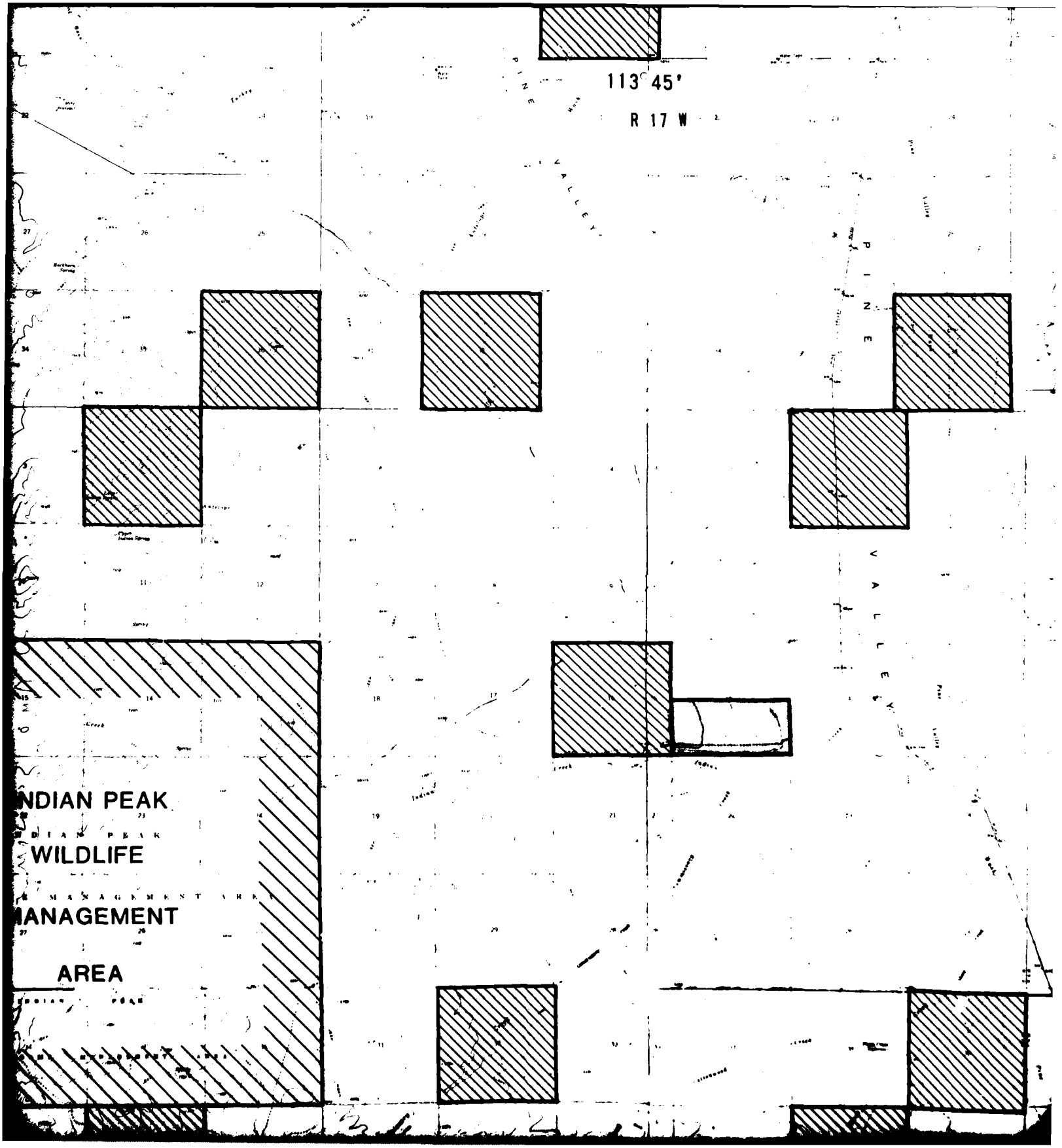
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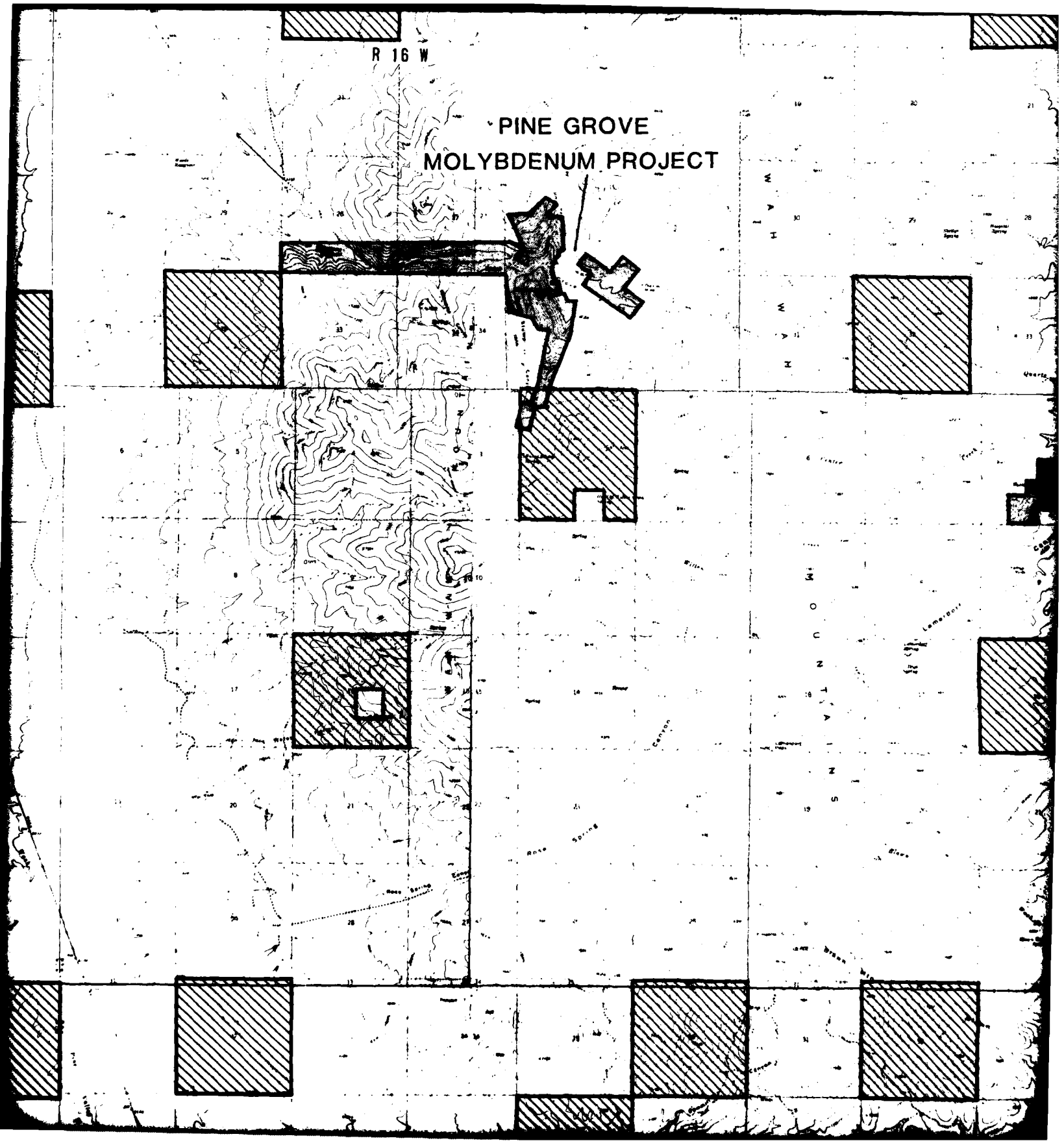
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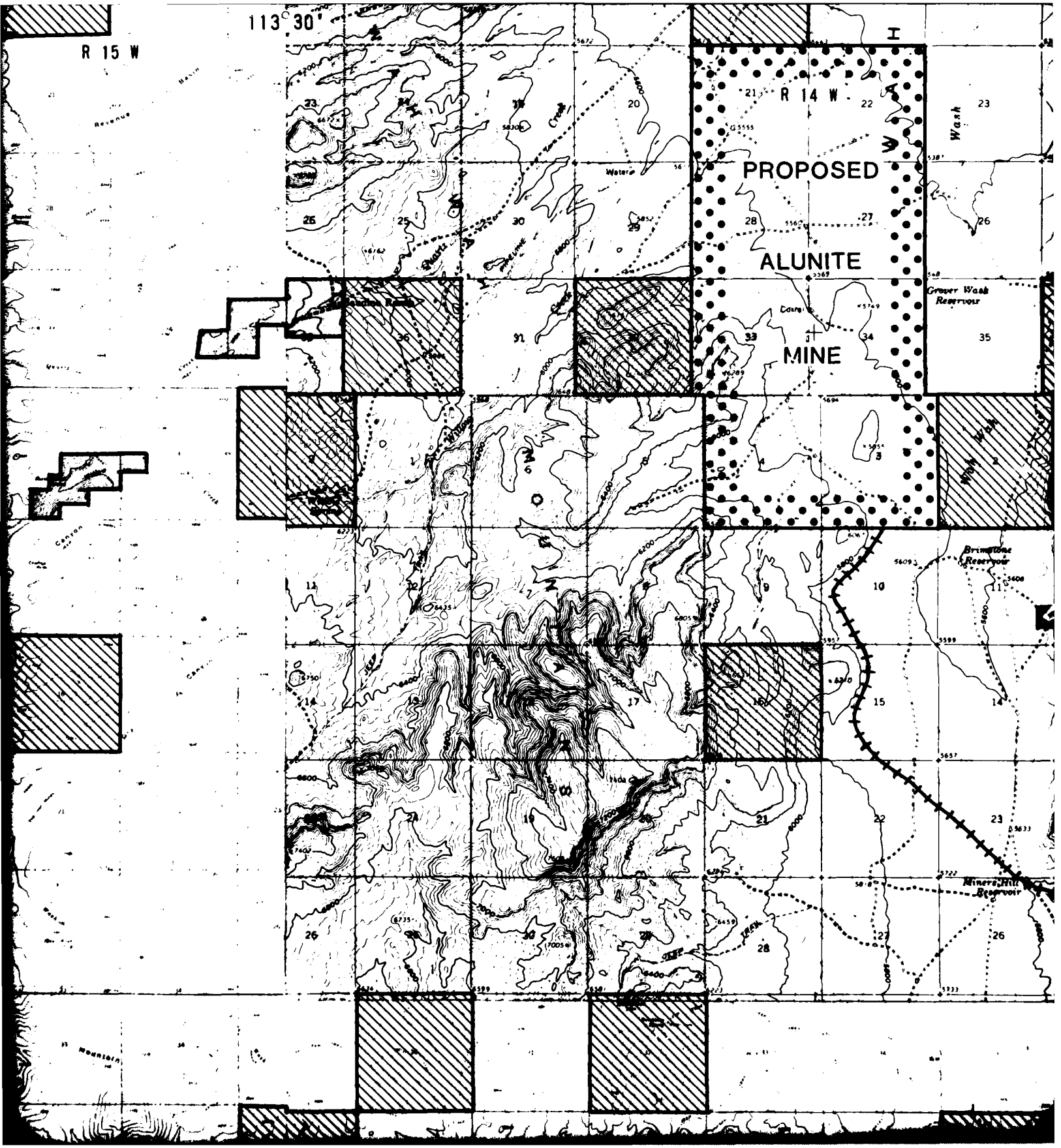
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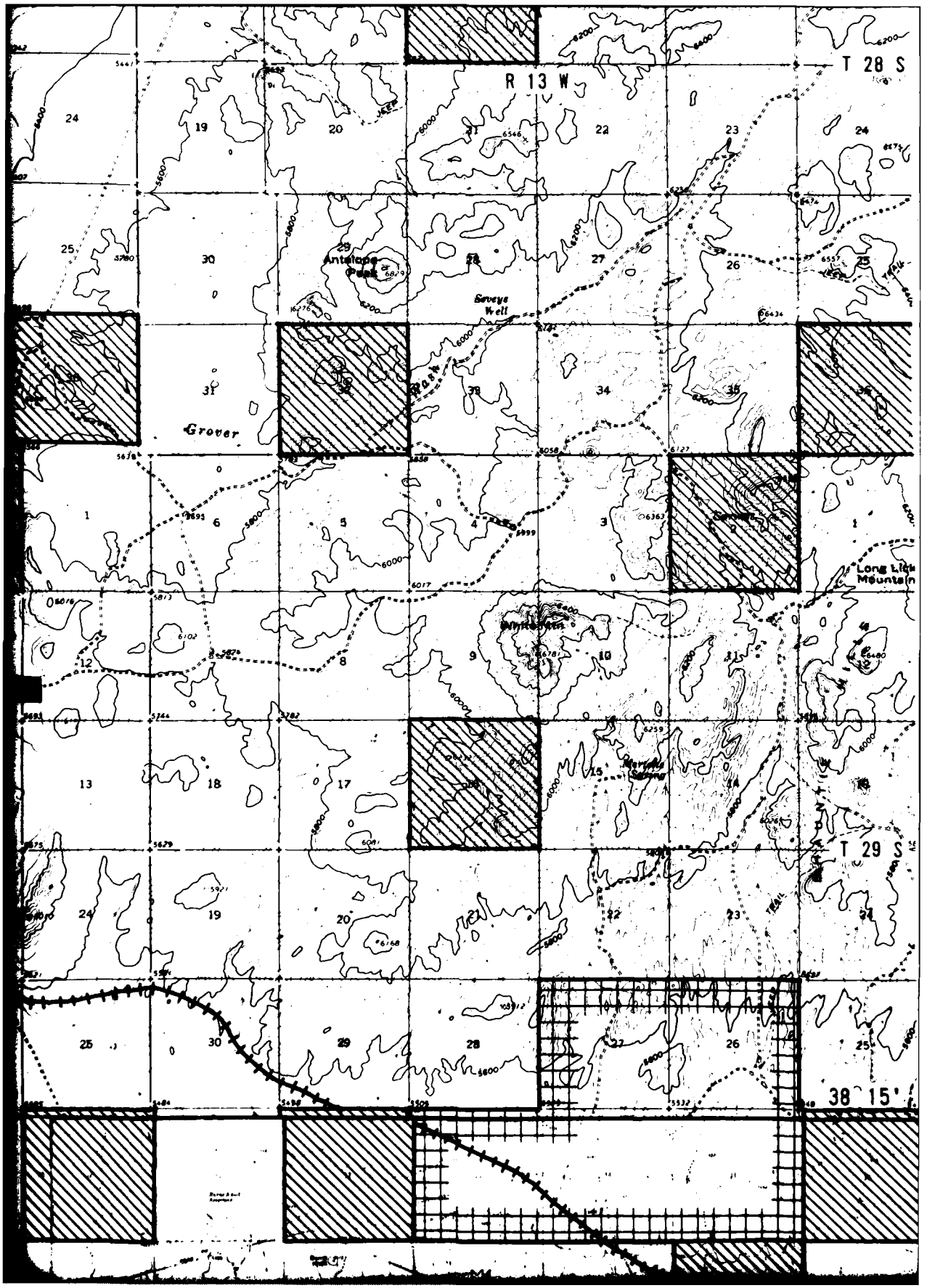
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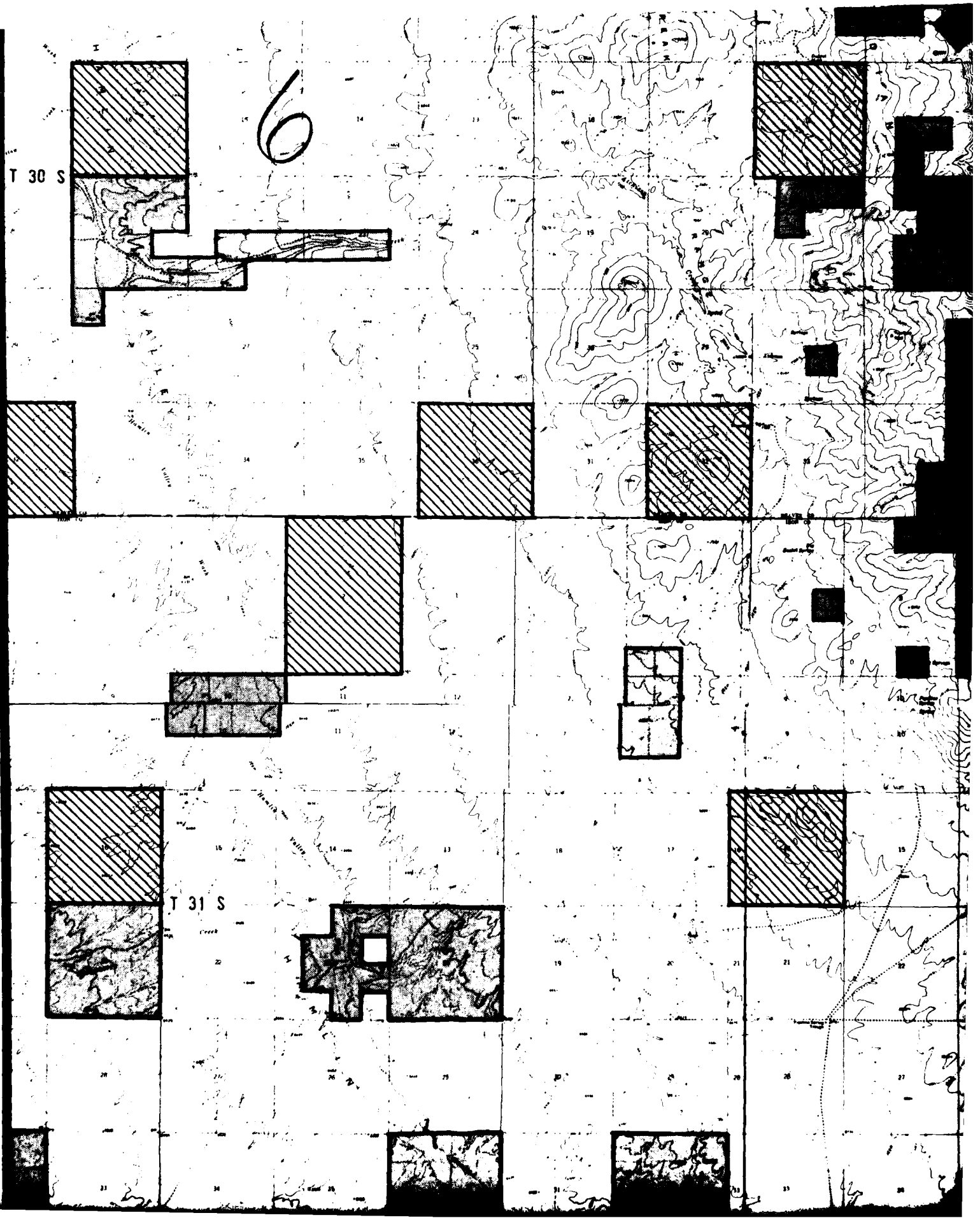
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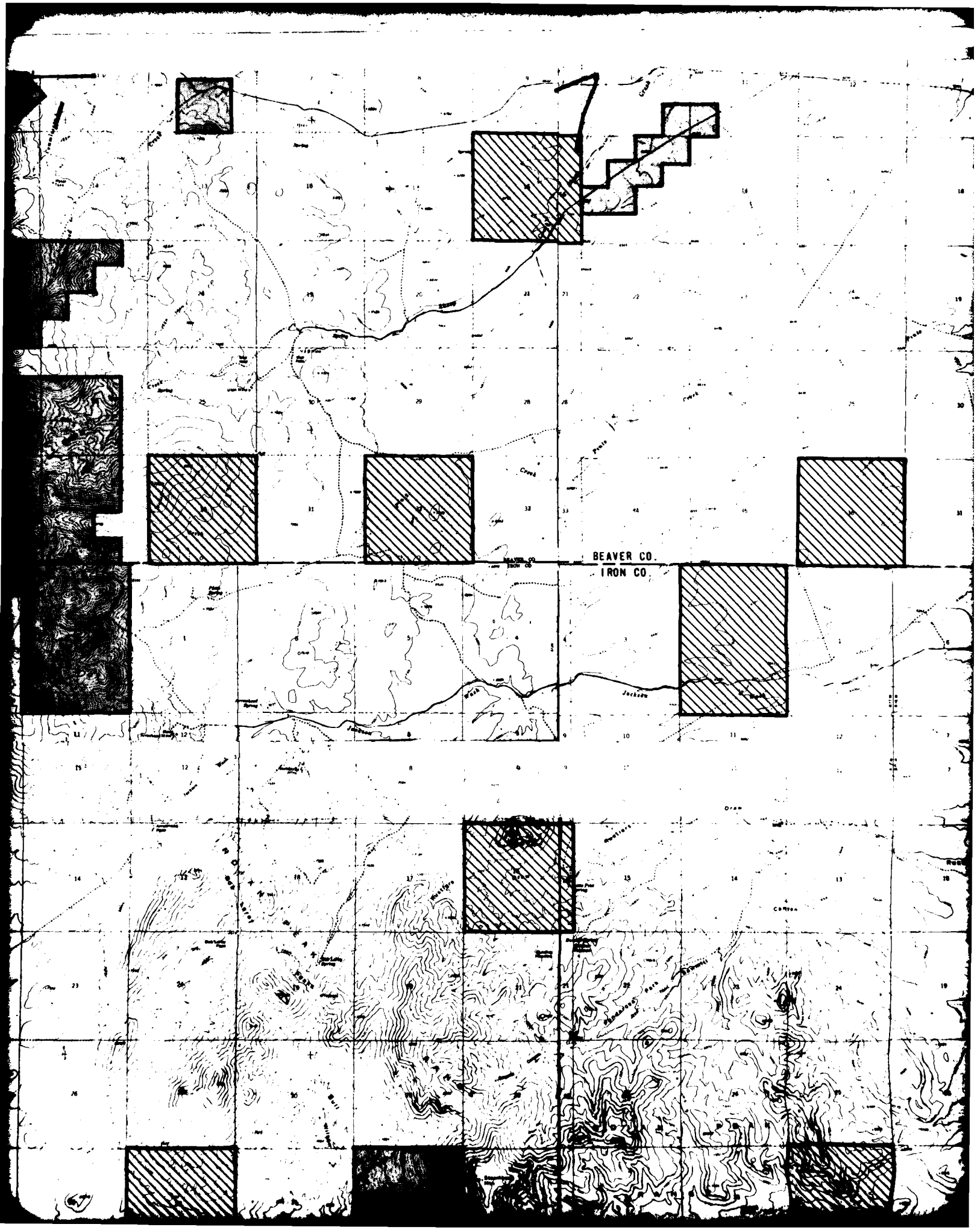
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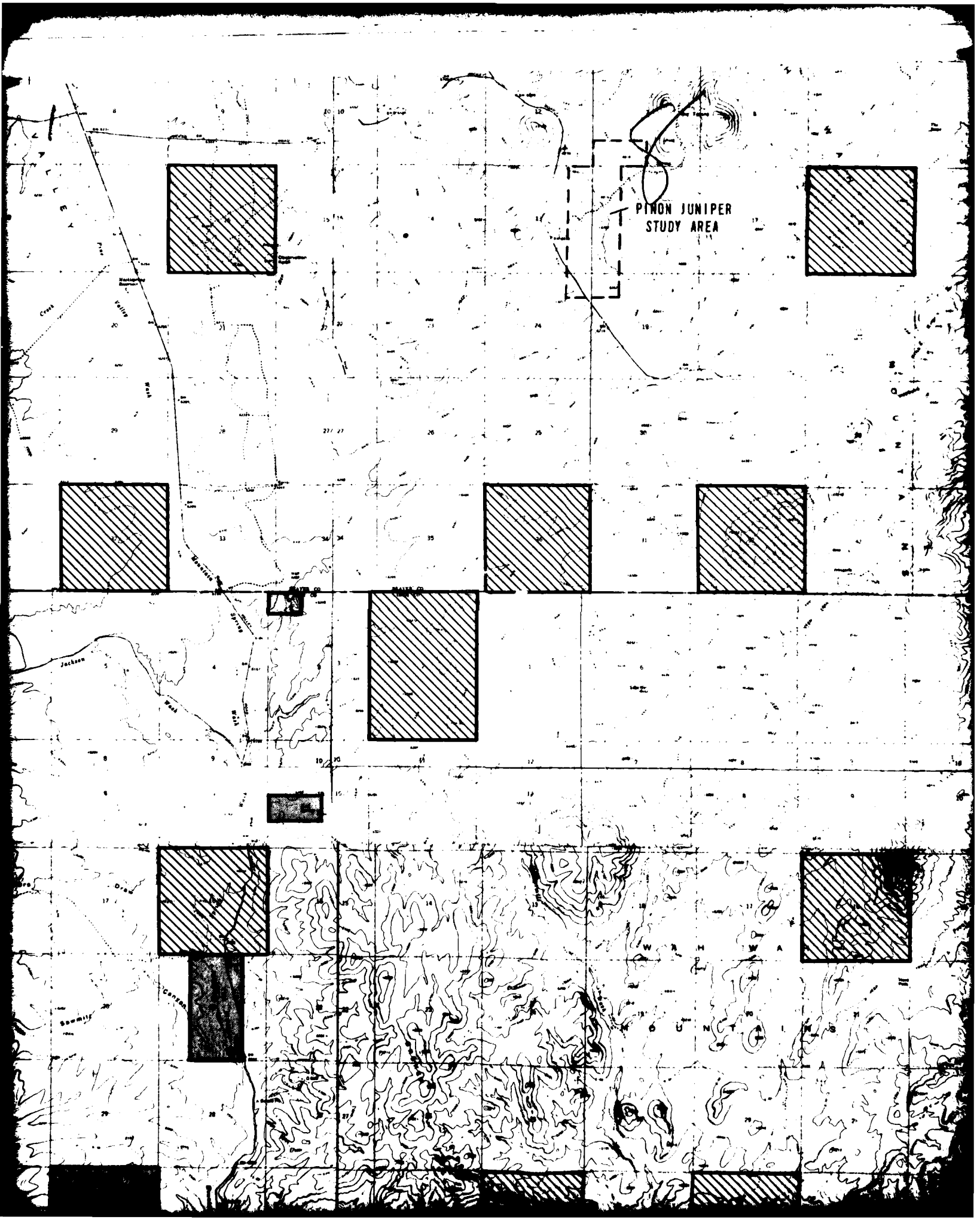
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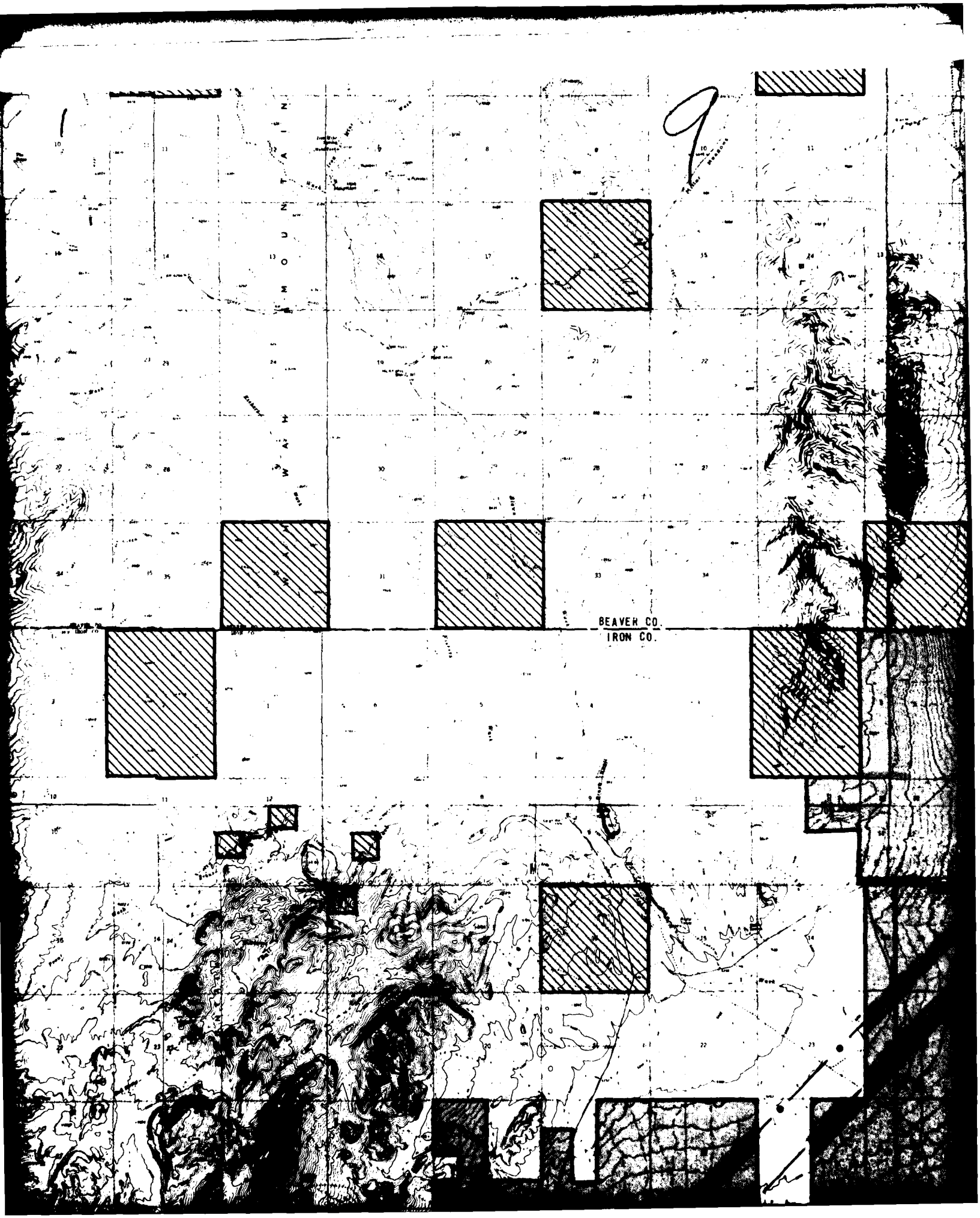
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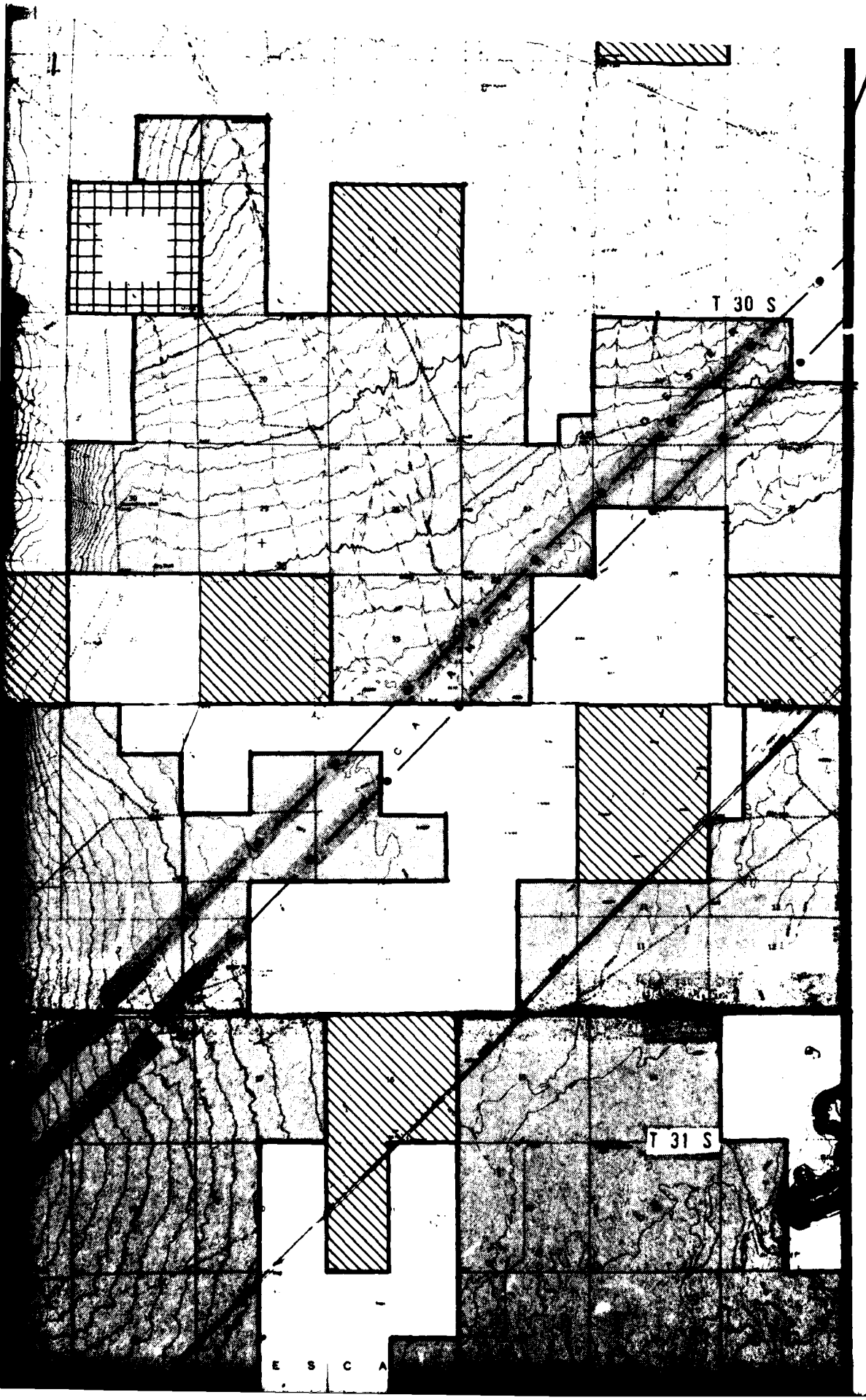
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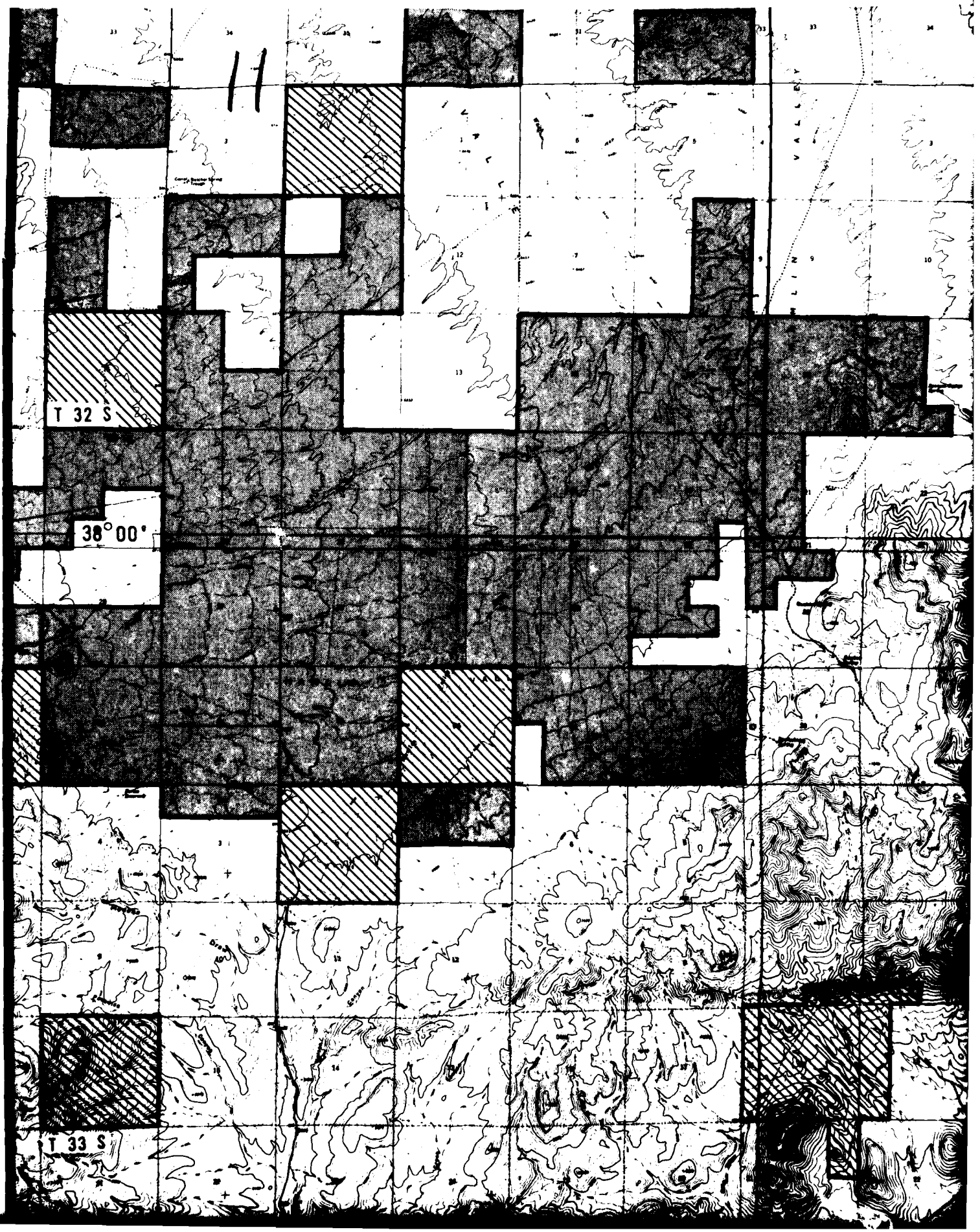
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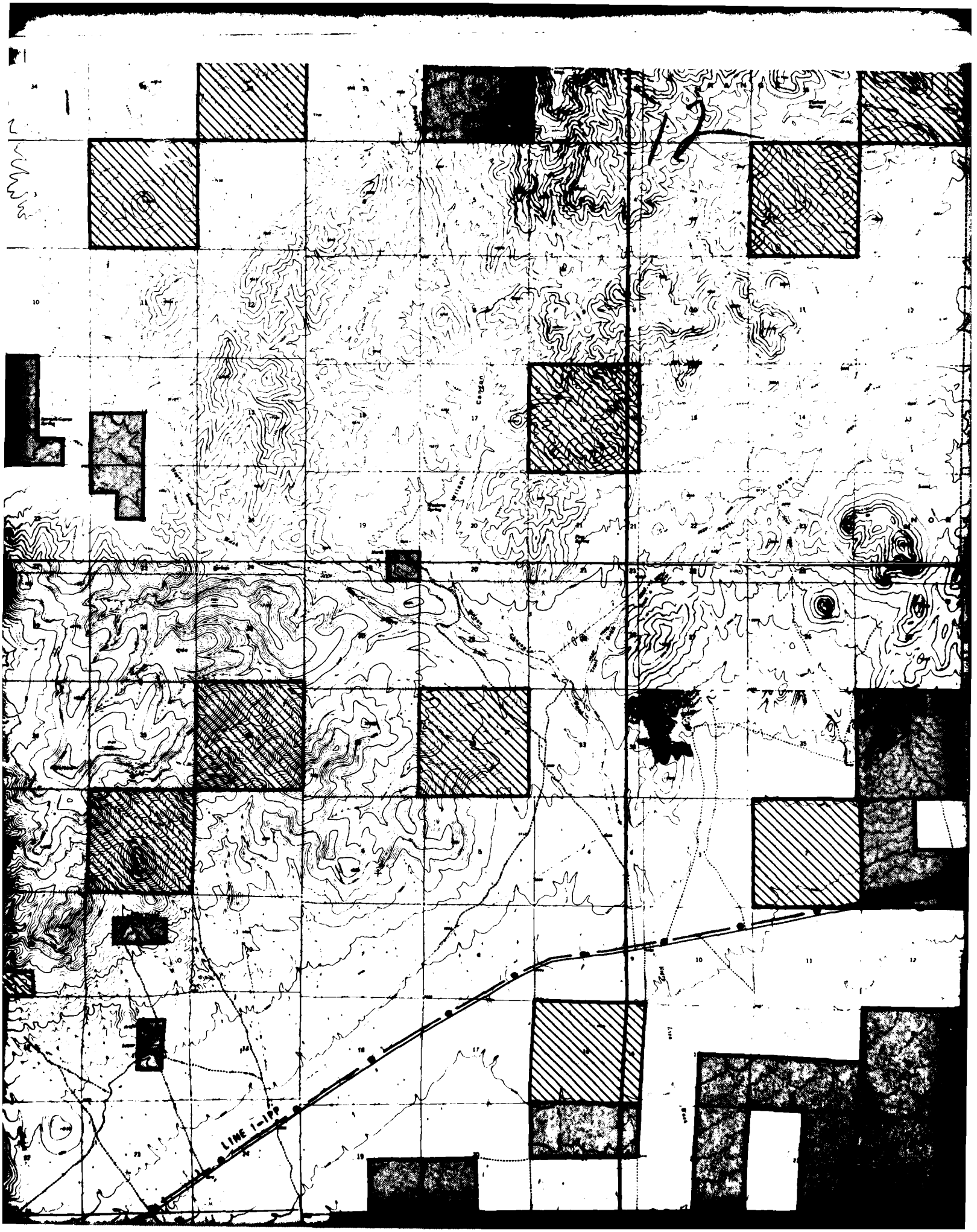
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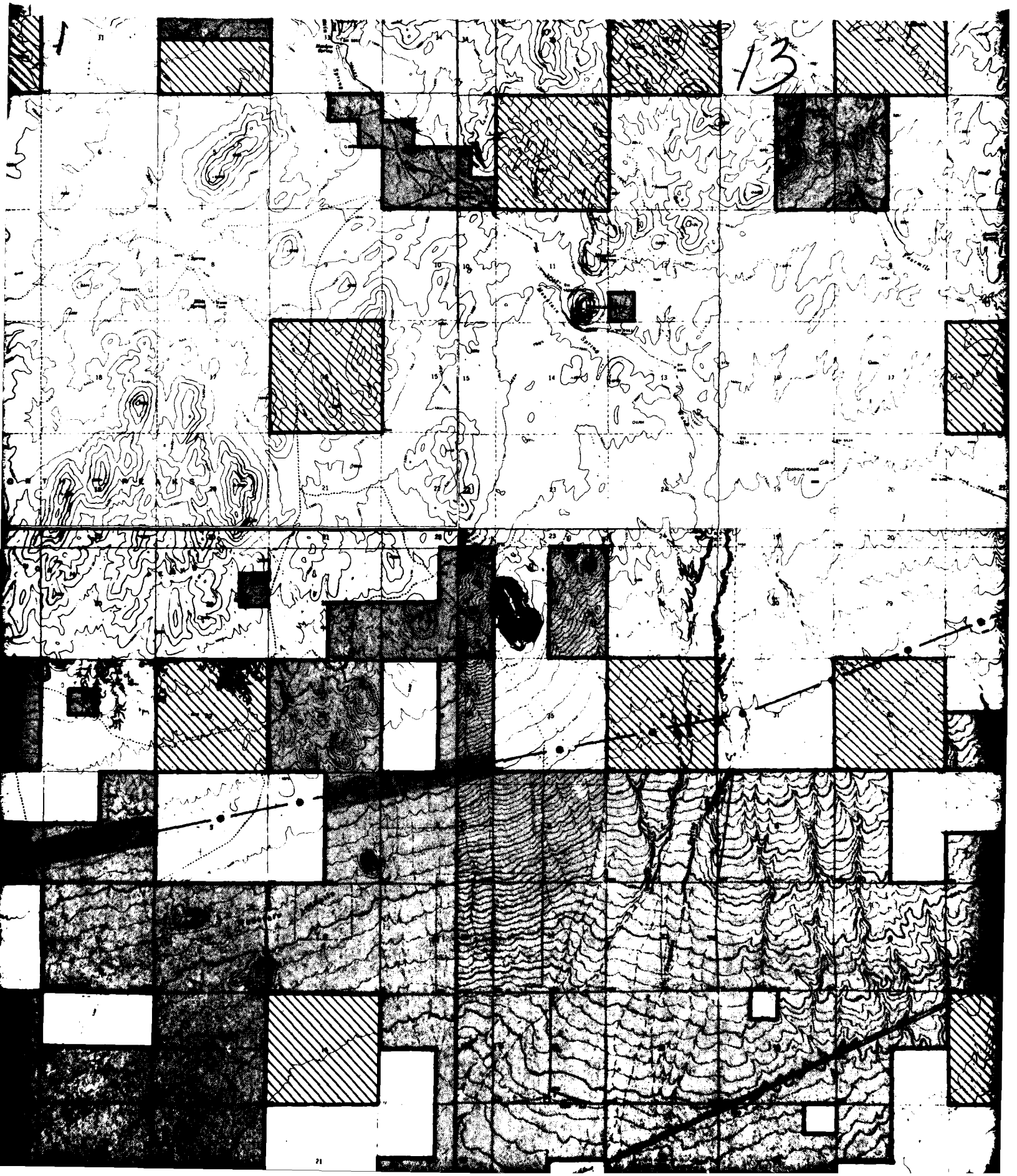

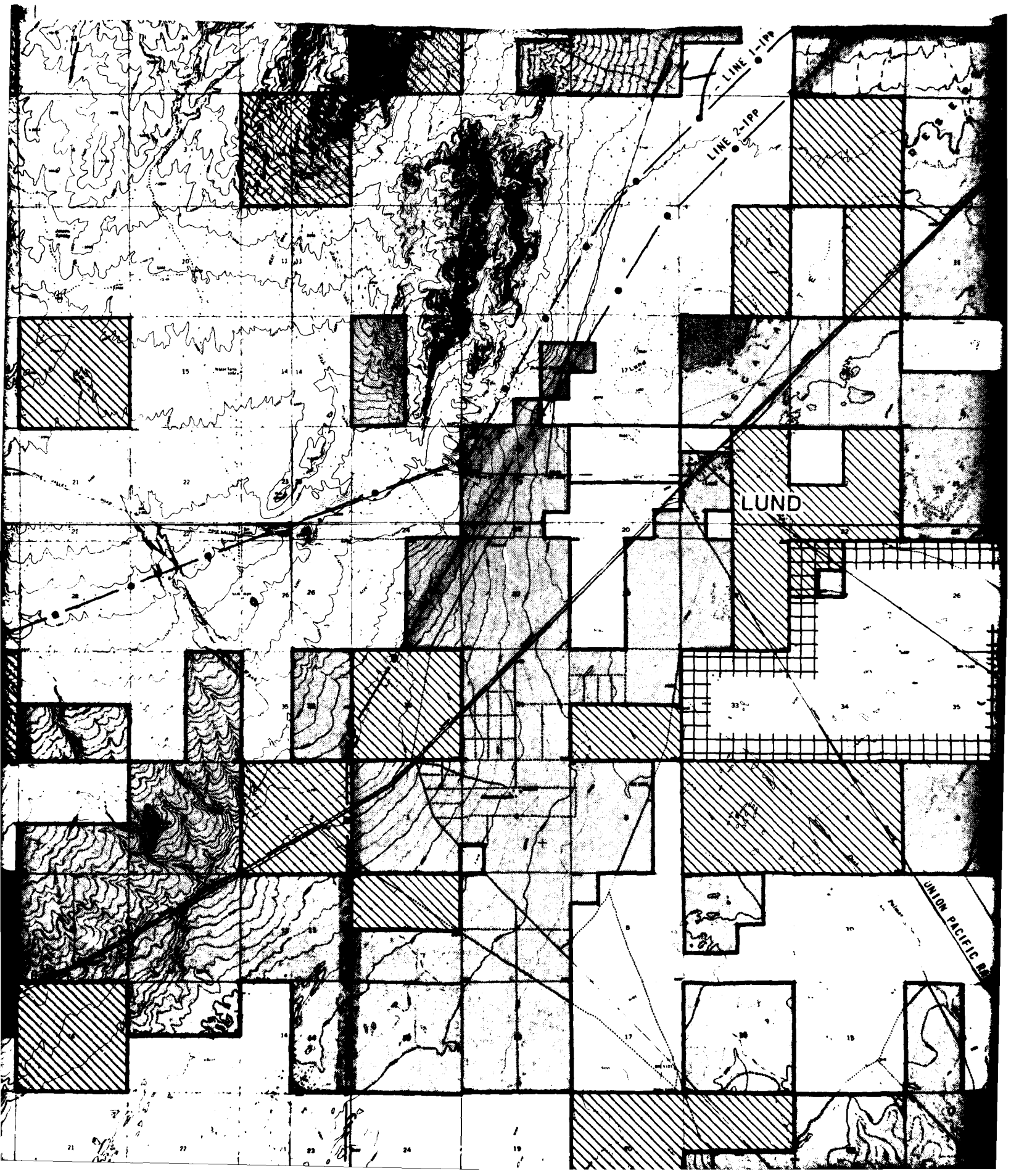
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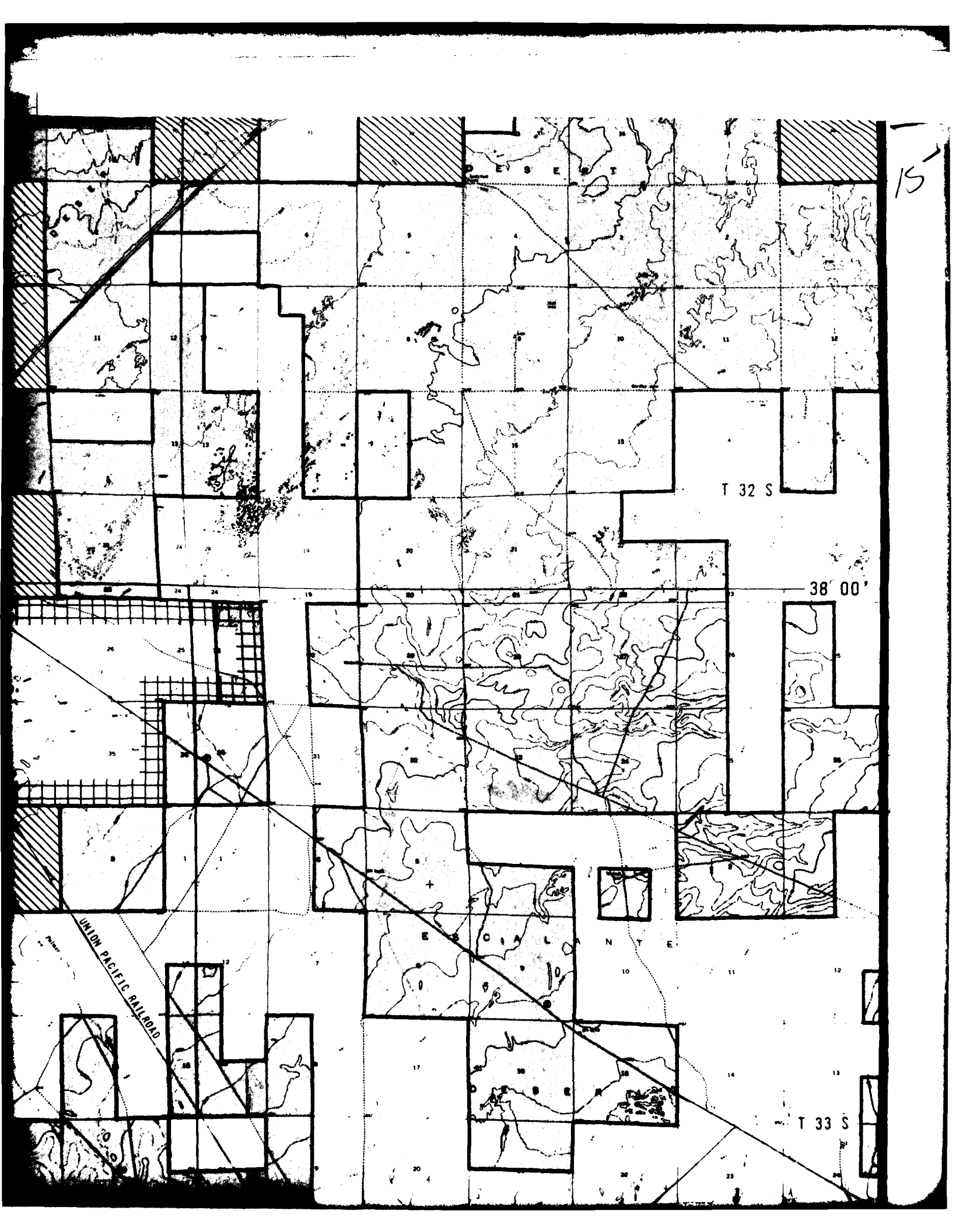
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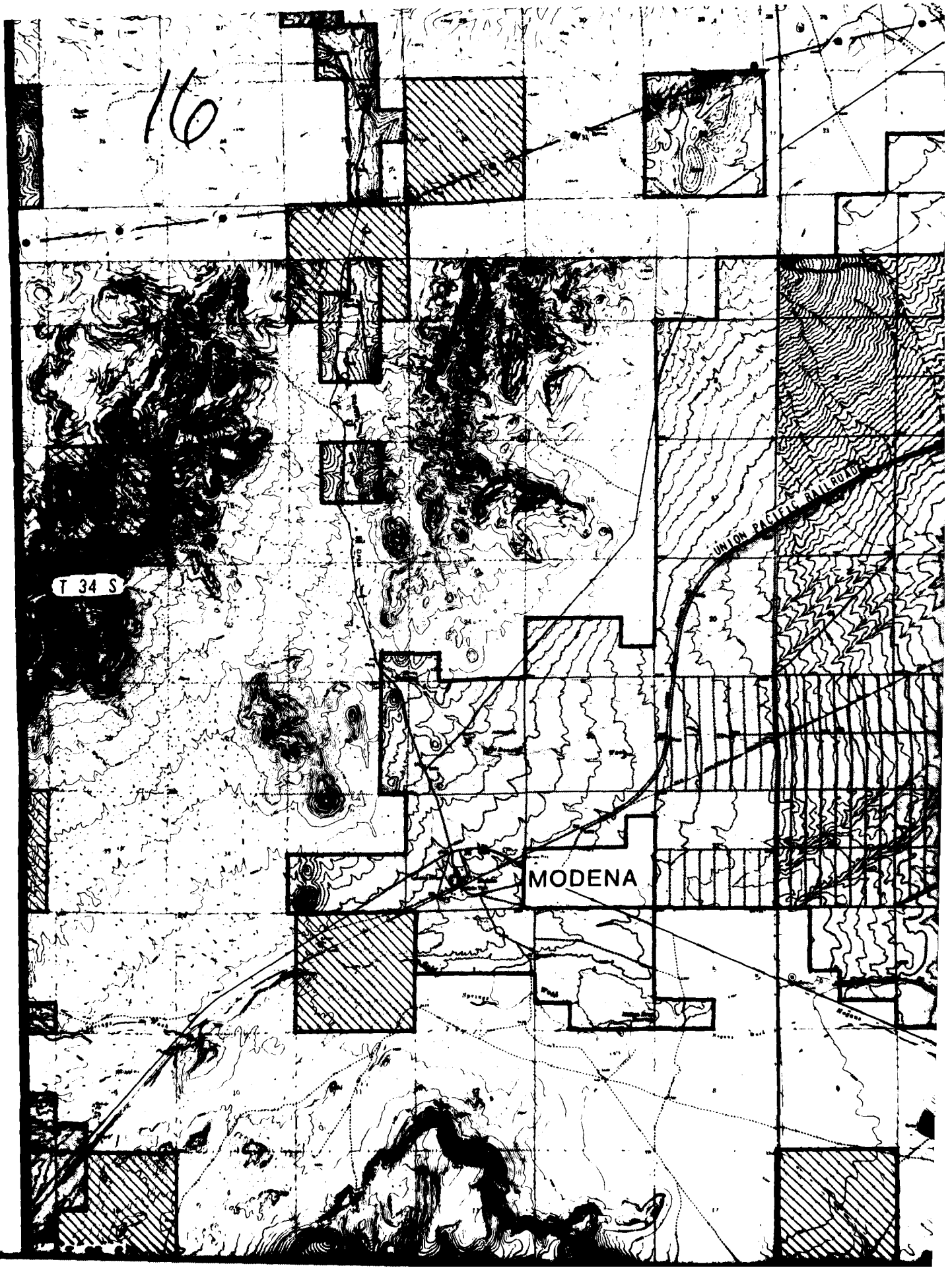
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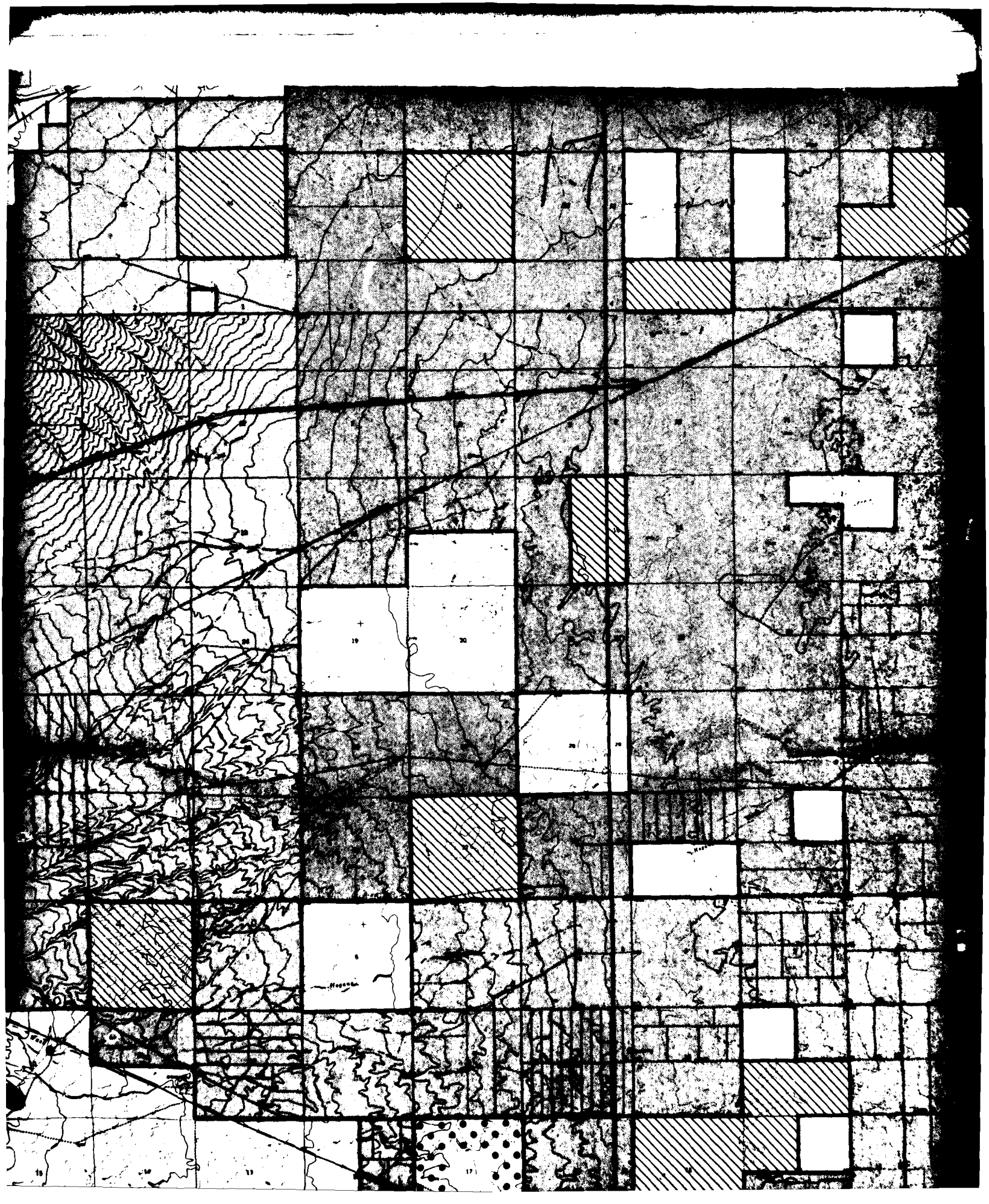

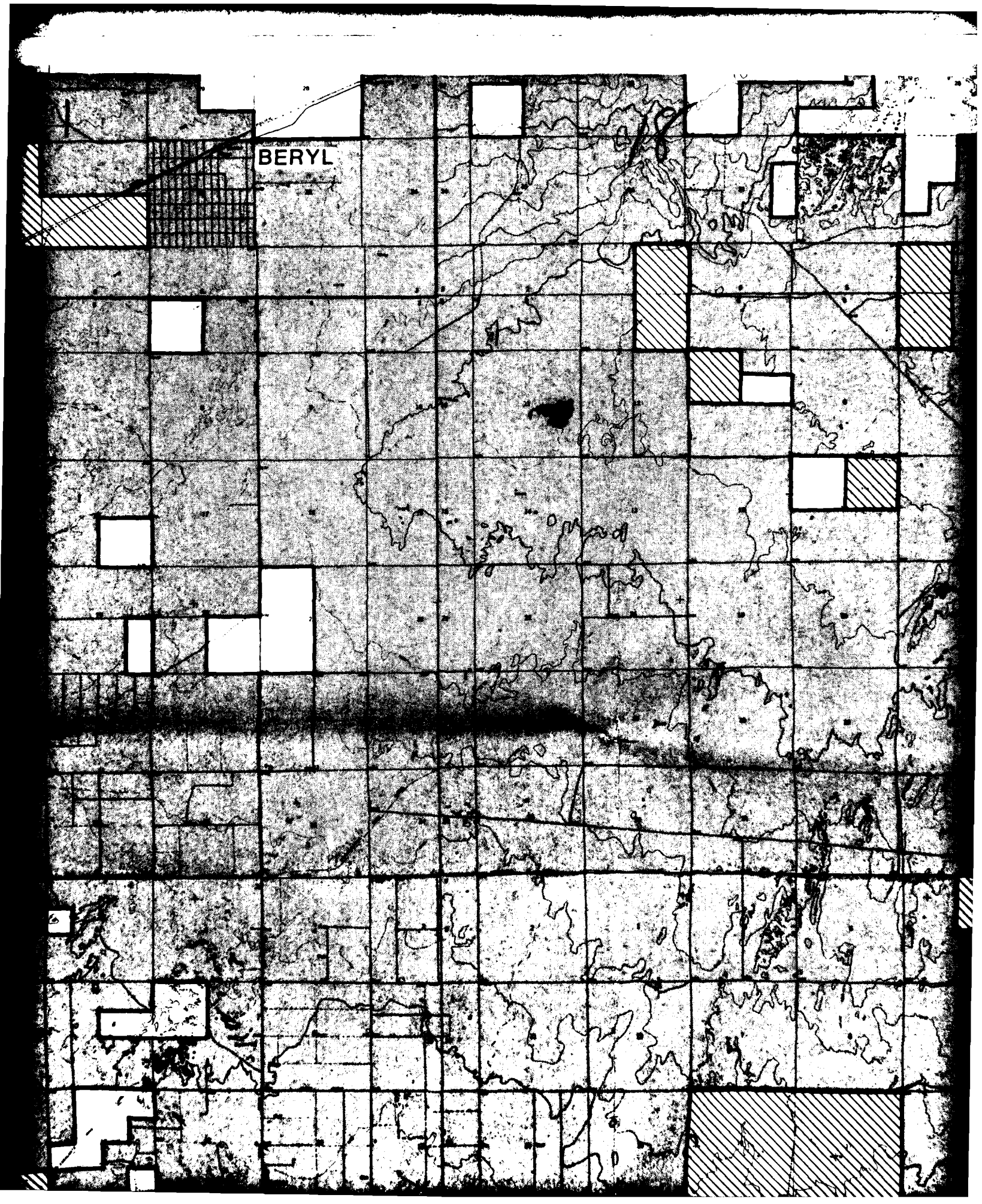
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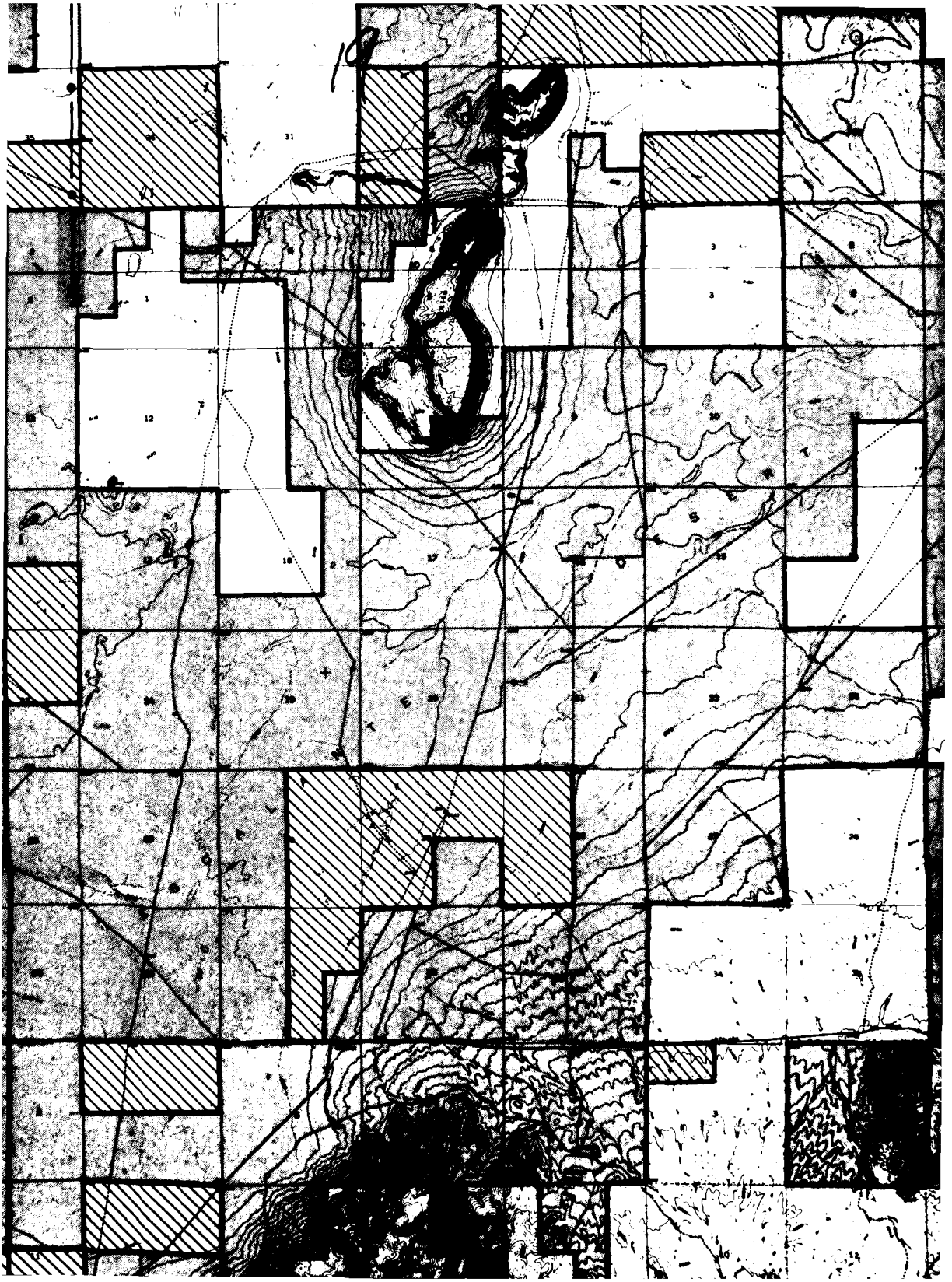

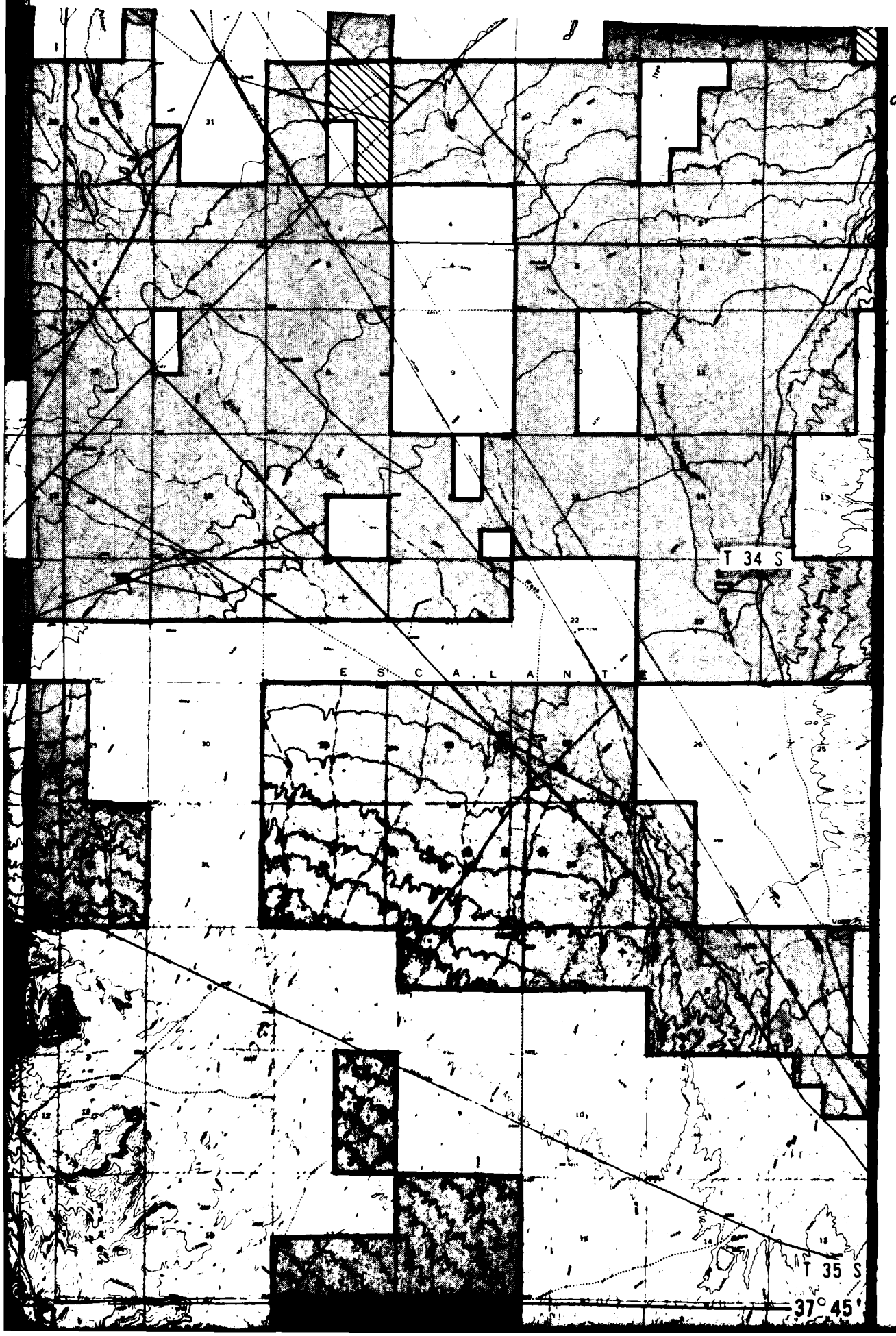
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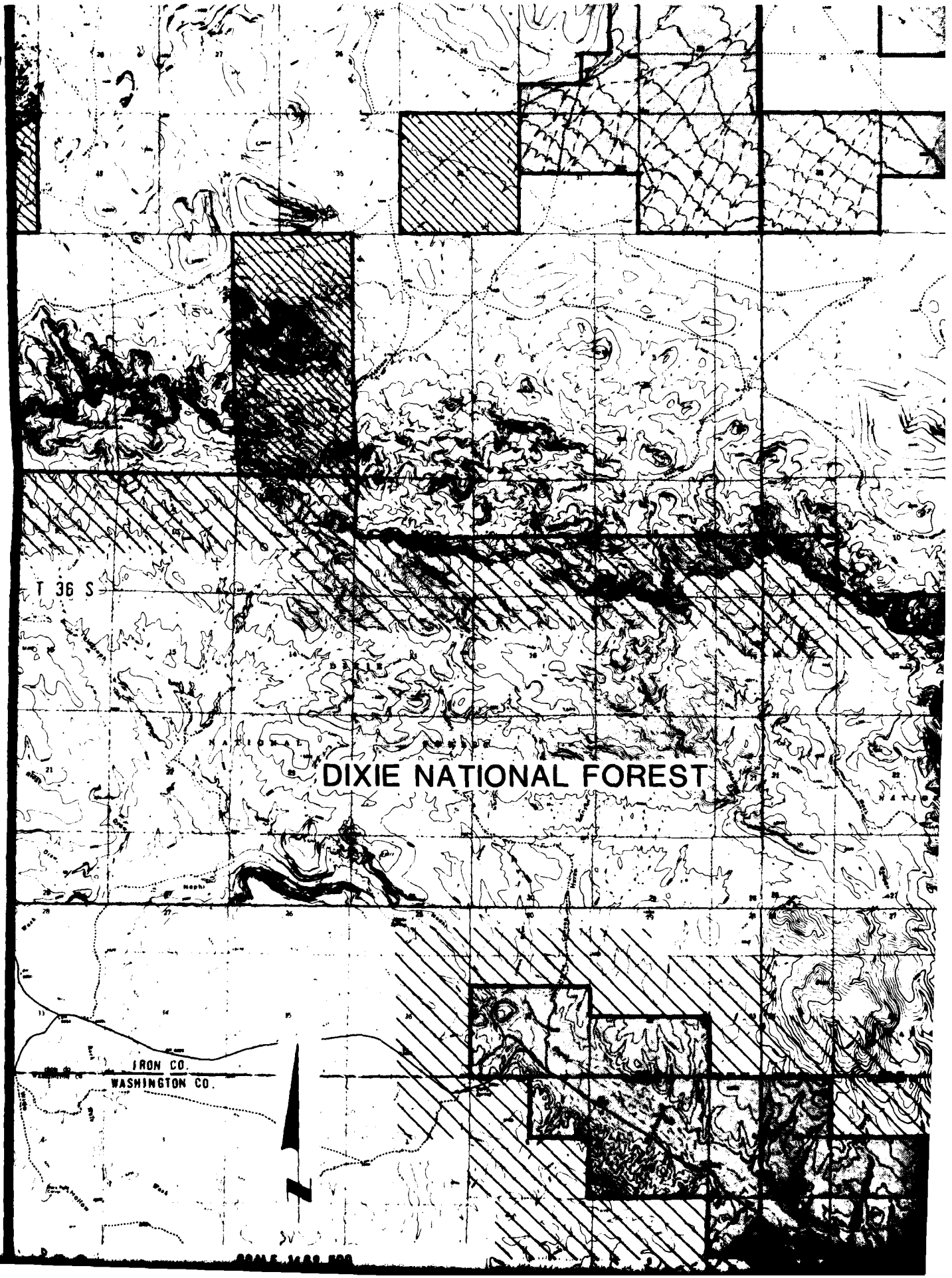
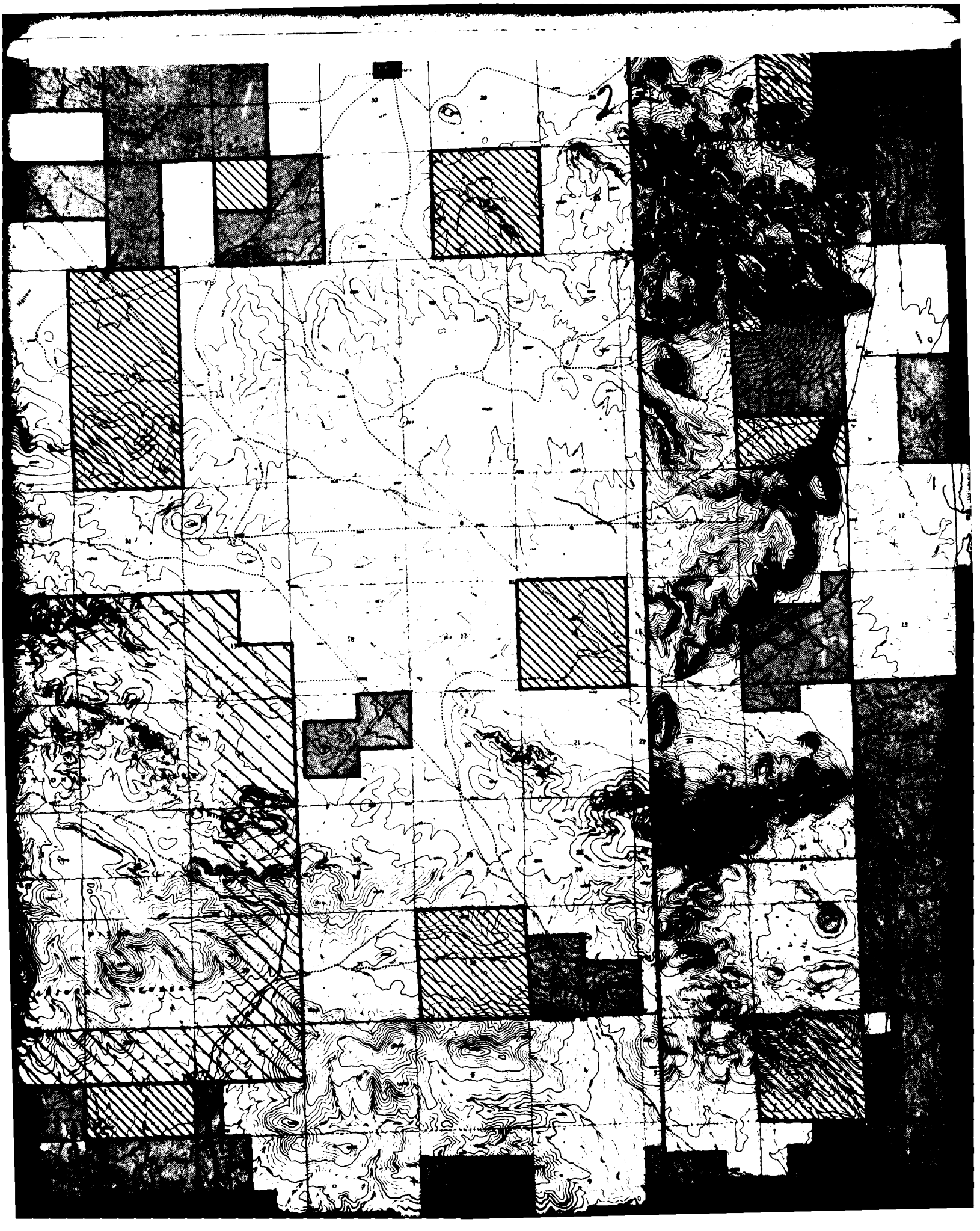
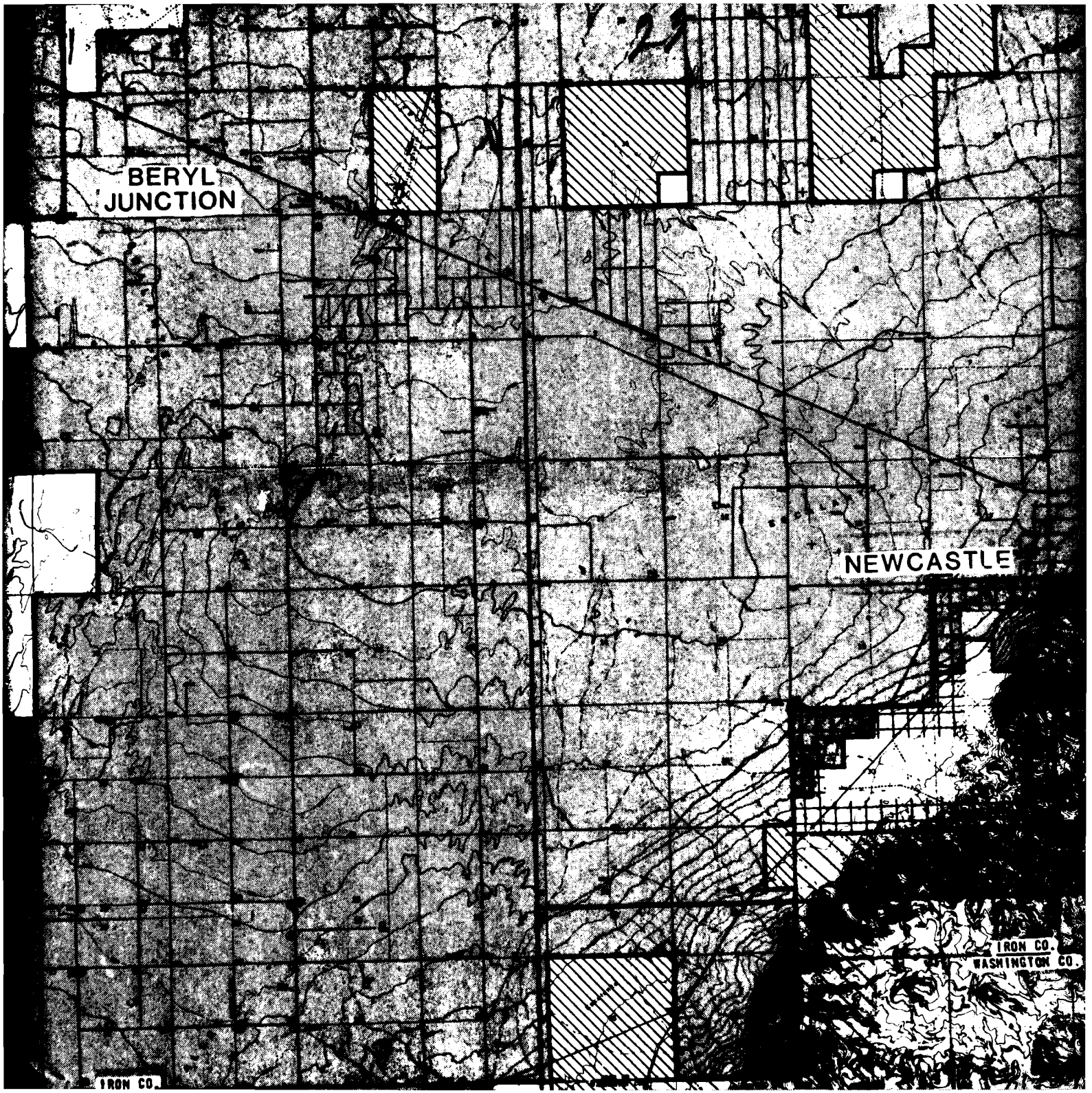
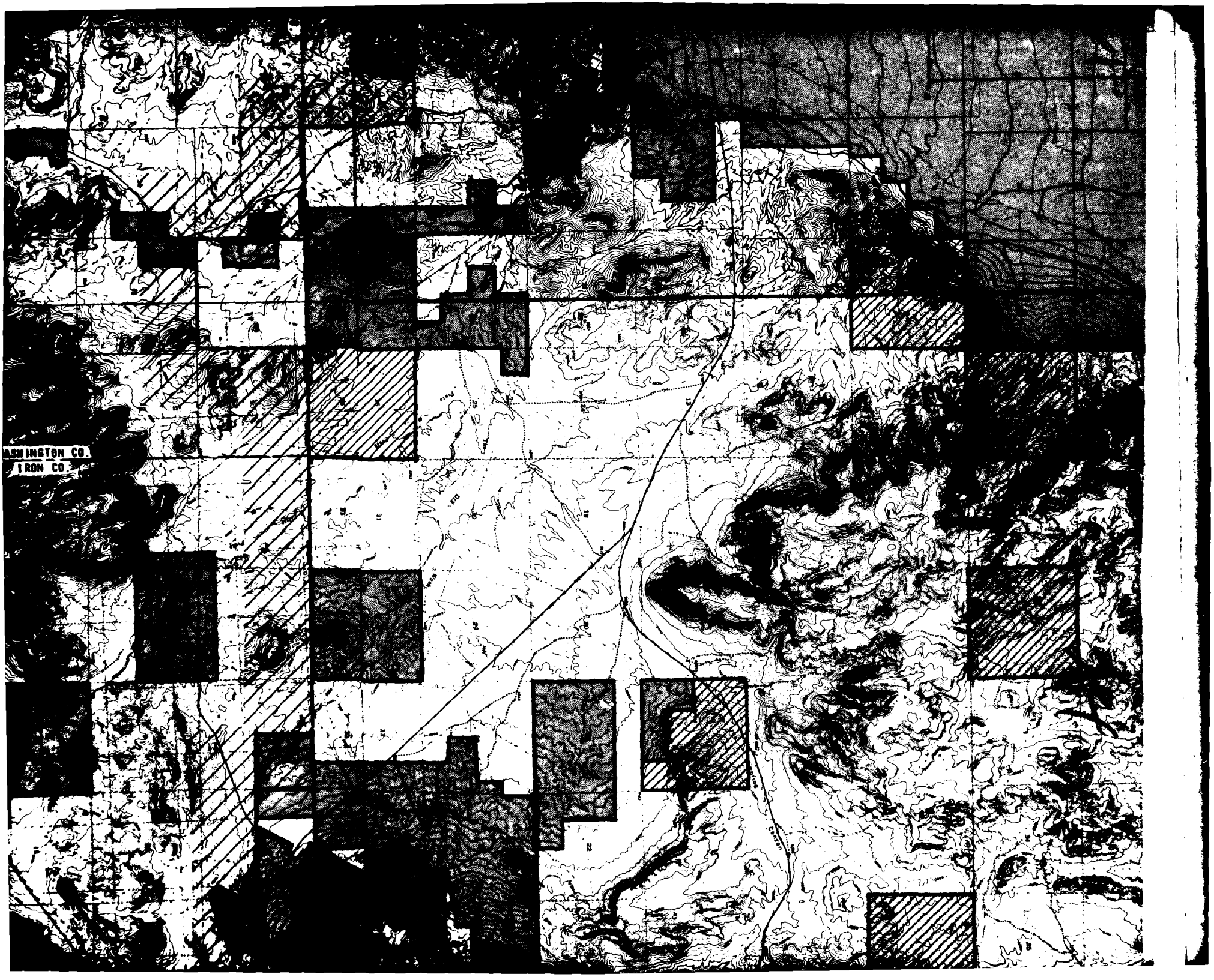
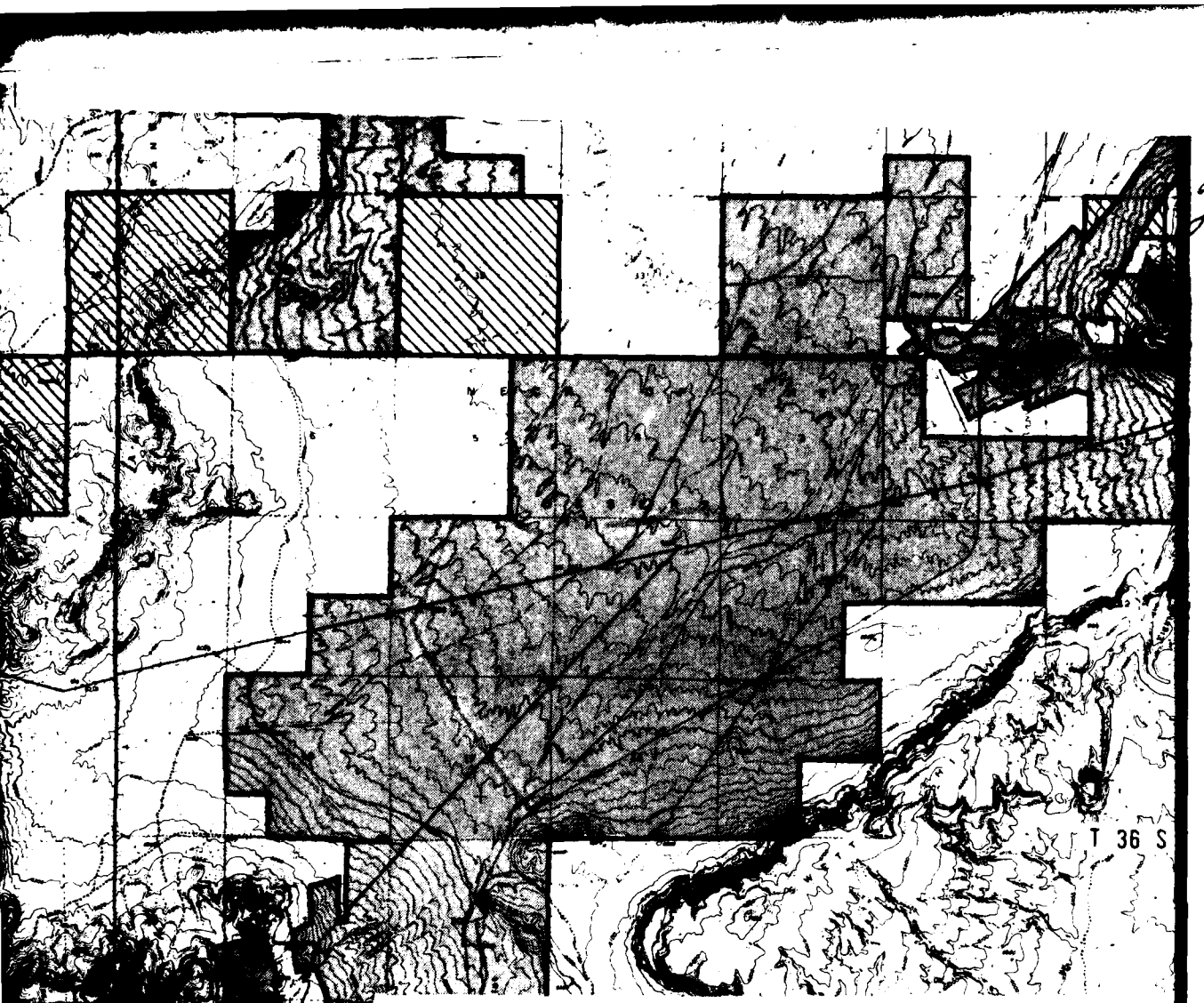
T 35 S
37° 45'


T 36 S
DIXIE NATIONAL FOREST
IRON CO.
WASHINGTON CO.



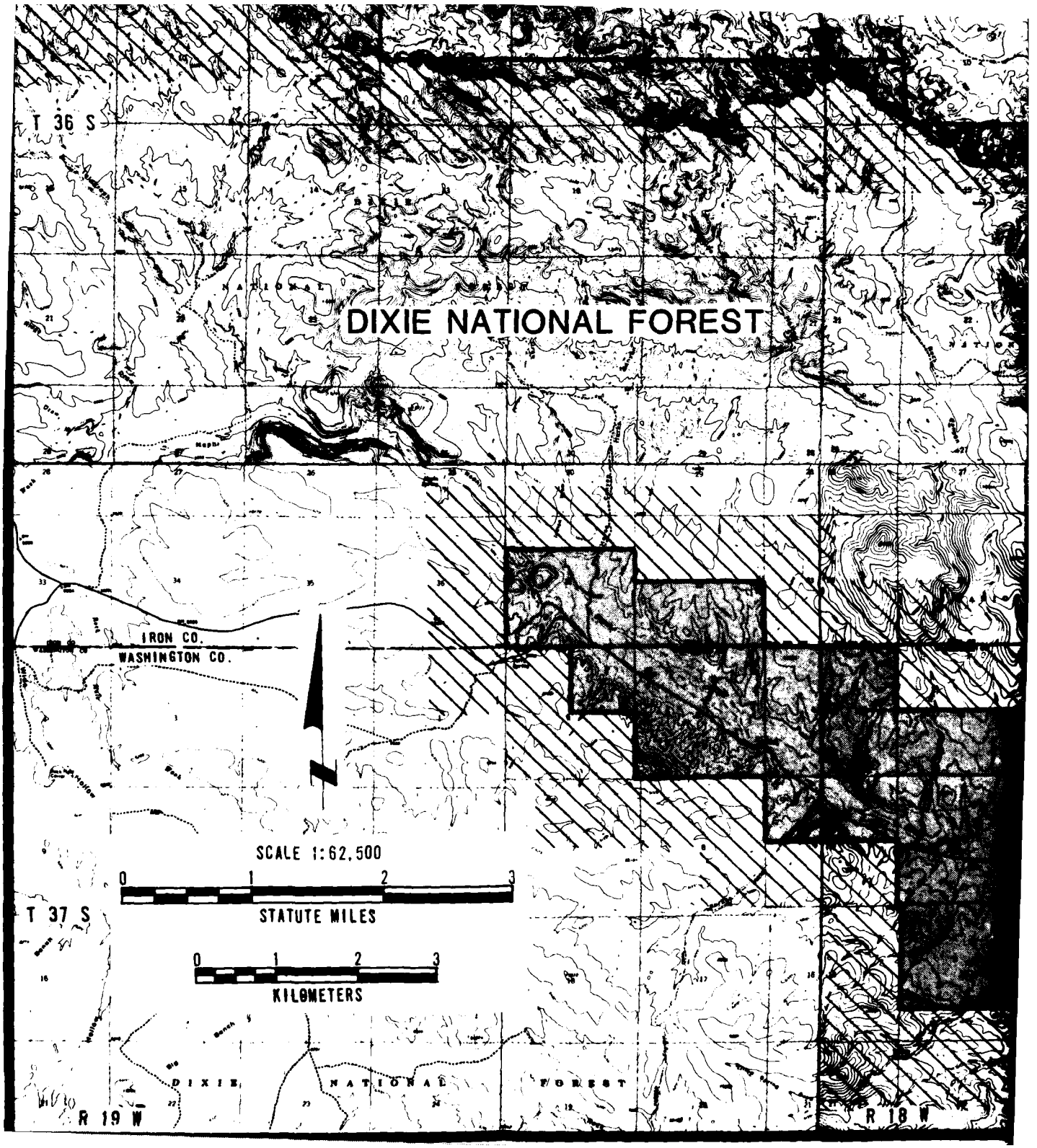

BERYL
JUNCTION
NEWCASTLE
IRON CO.
WASHINGTON CO.
IRON CO.

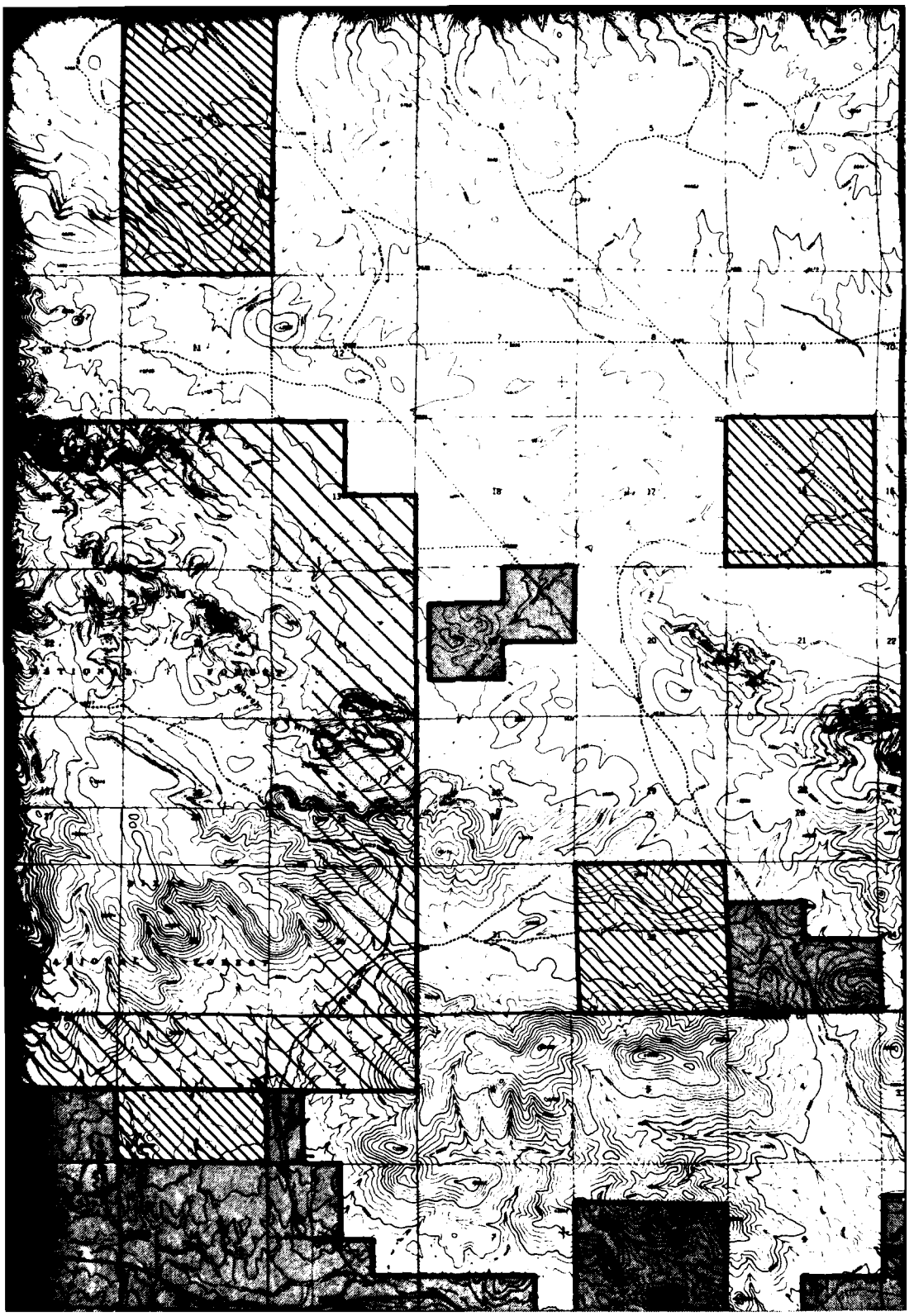

ASHINGTON CO.
IRON CO.

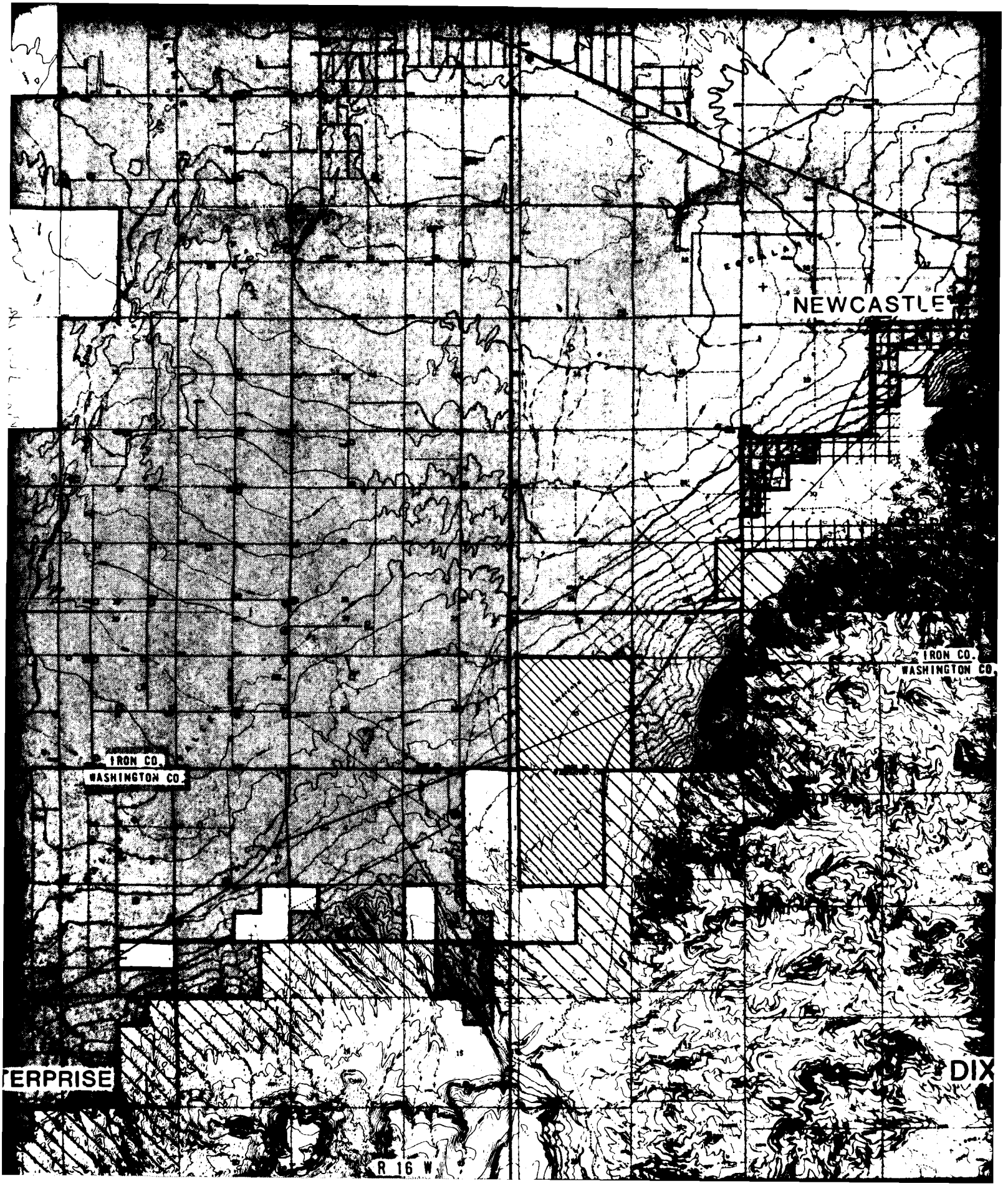


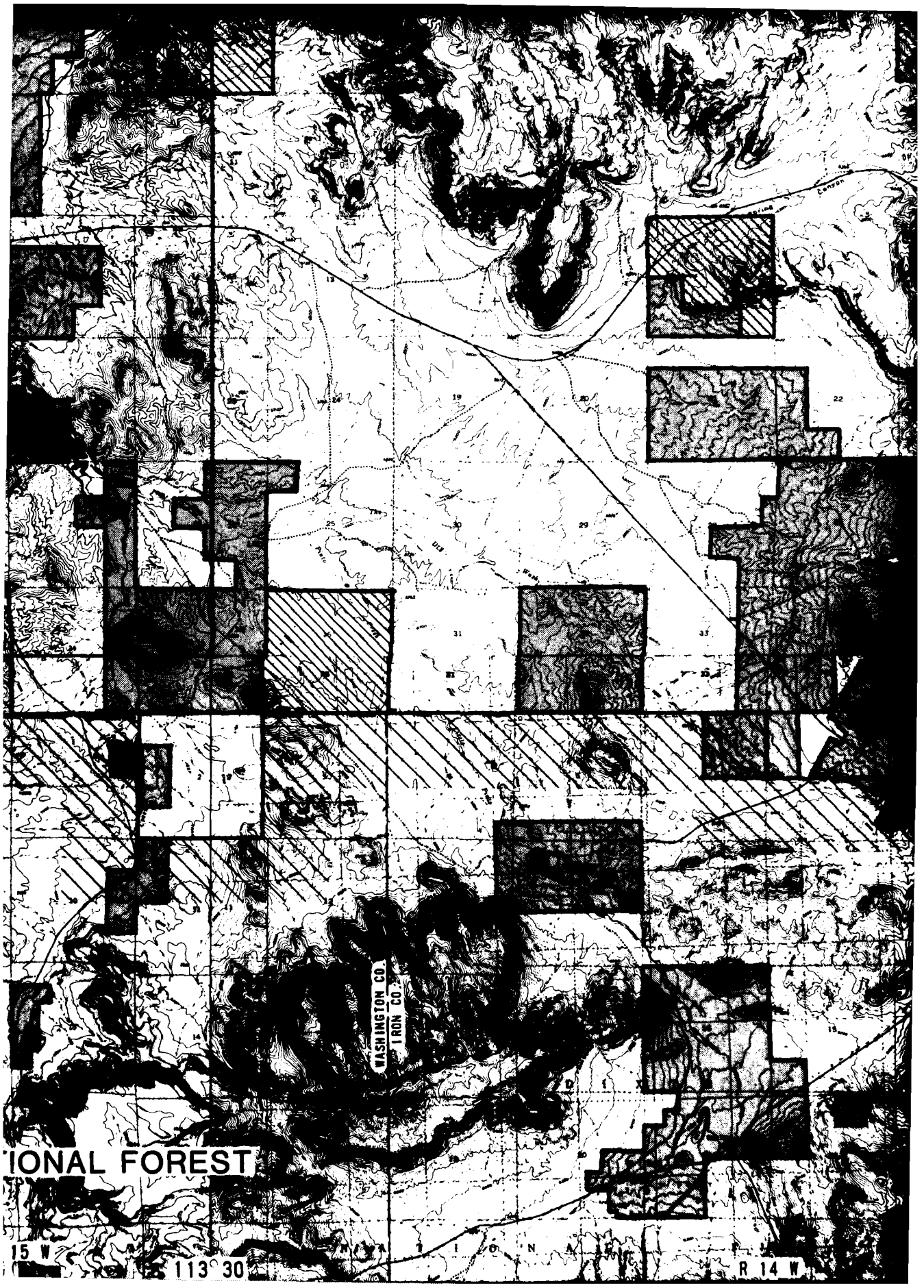
EXPLANATION

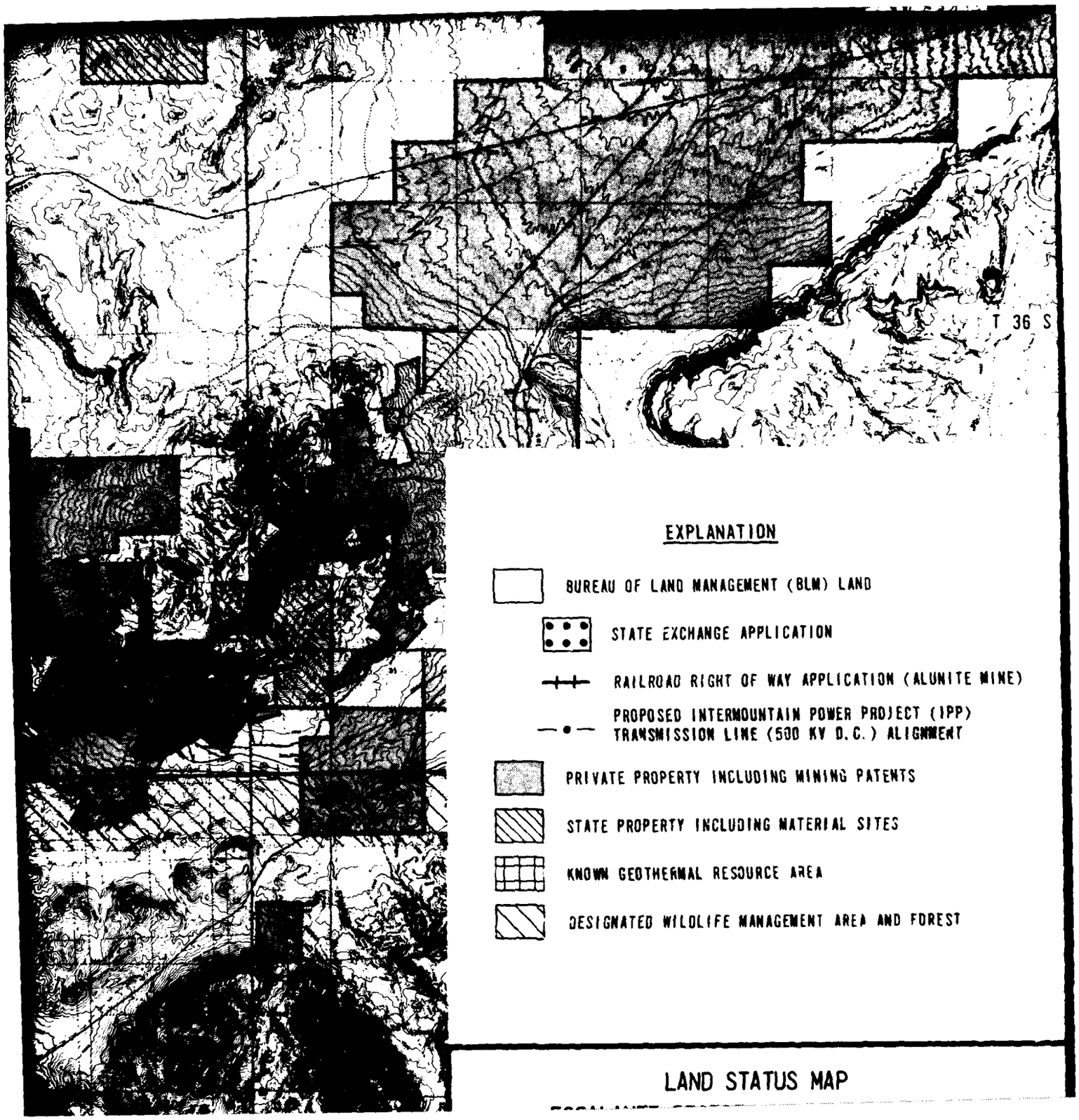
- BUREAU OF LAND MANAGEMENT (BLM) LAND
- STATE EXCHANGE APPLICATION
- RAILROAD RIGHT OF WAY APPLICATION (ALUNITE MINE)
- PROPOSED INTERMOUNTAIN POWER PROJECT (IPP) TRANSMISSION LINE (500 KV D.C.) ALIGNMENT
- PRIVATE PROPERTY INCLUDING MINING PATENTS
- STATE PROPERTY INCLUDING MATERIAL SITES
- KNOWN GEOTHERMAL RESOURCE AREA
- DESIGNATED WILDLIFE MANAGEMENT AREA AND FOREST


T 36 S
DIXIE NATIONAL FOREST
IRON CO.
WASHINGTON CO.
SCALE 1:62,500
0 1 2 3
STATUTE MILES
0 1 2 3
KILOMETERS
T 37 S
DIXIE NATIONAL FOREST
R 19 W
R 18 W

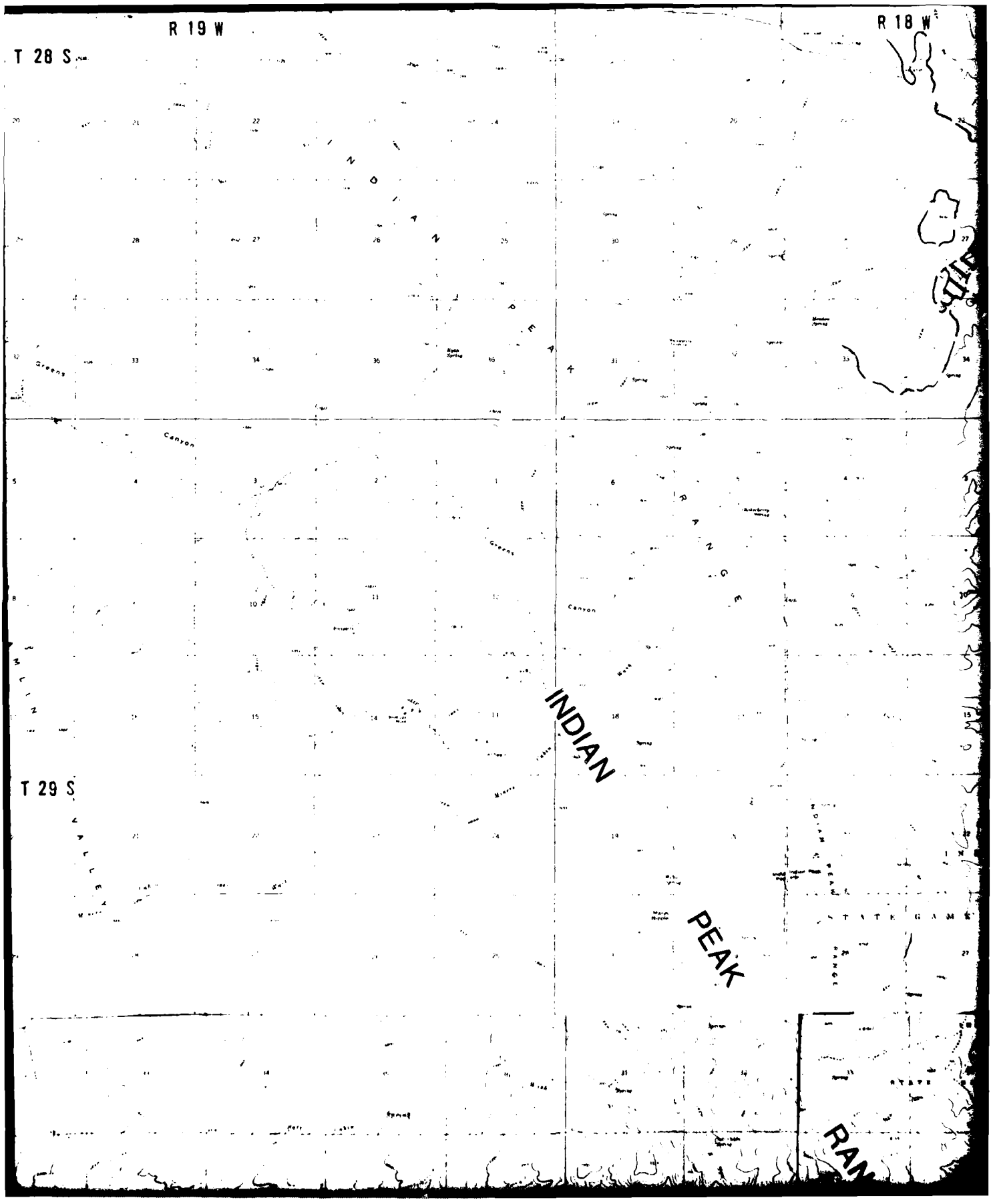


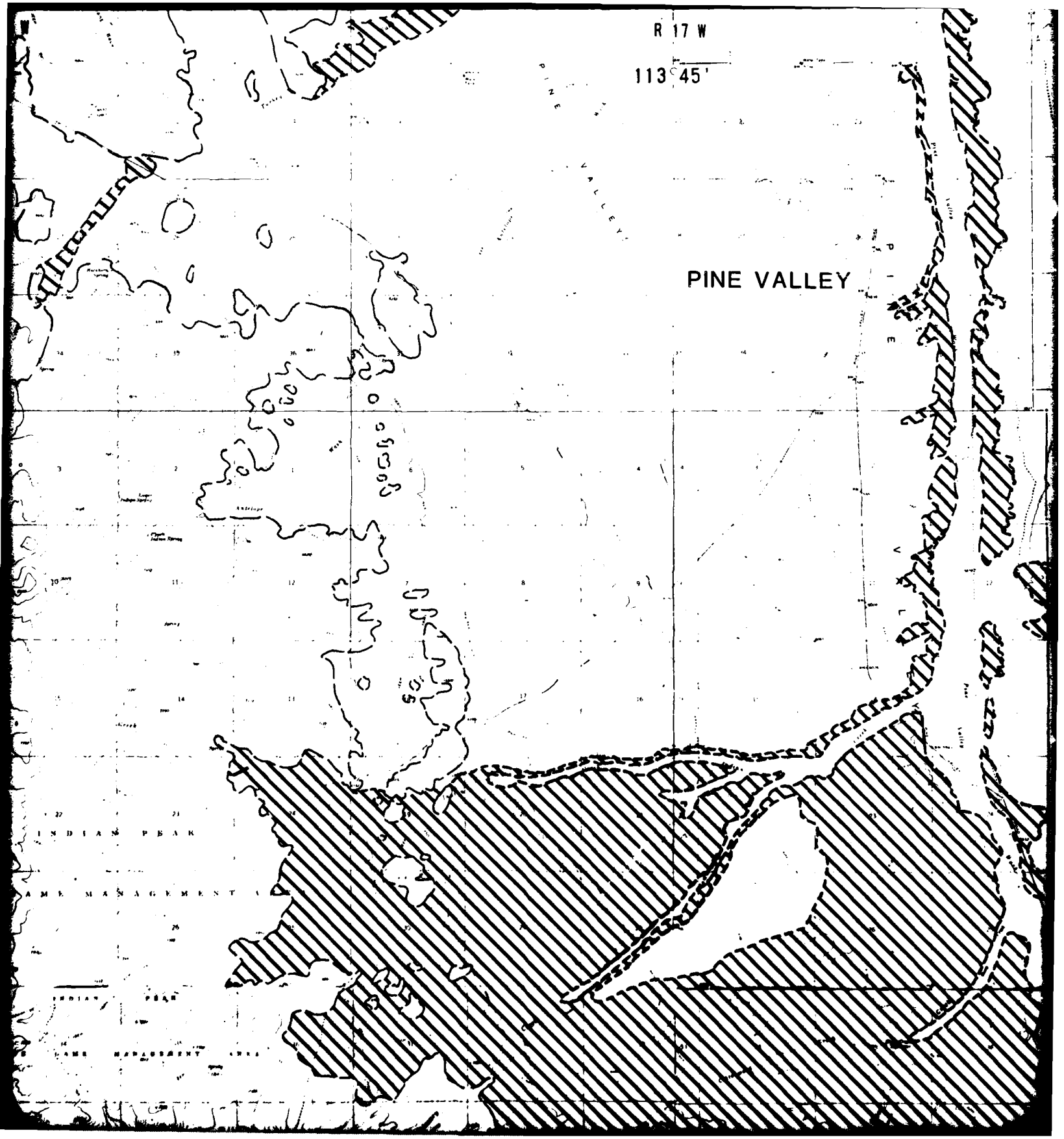

NEWCASTLE
IRON CO.
WASHINGTON CO.
IRON CO.
WASHINGTON CO.
ERPRISE
DIX
R 16 W


WASHINGTON CO.
IRON CO.
IONAL FOREST
15 W
113 30
R 14 W

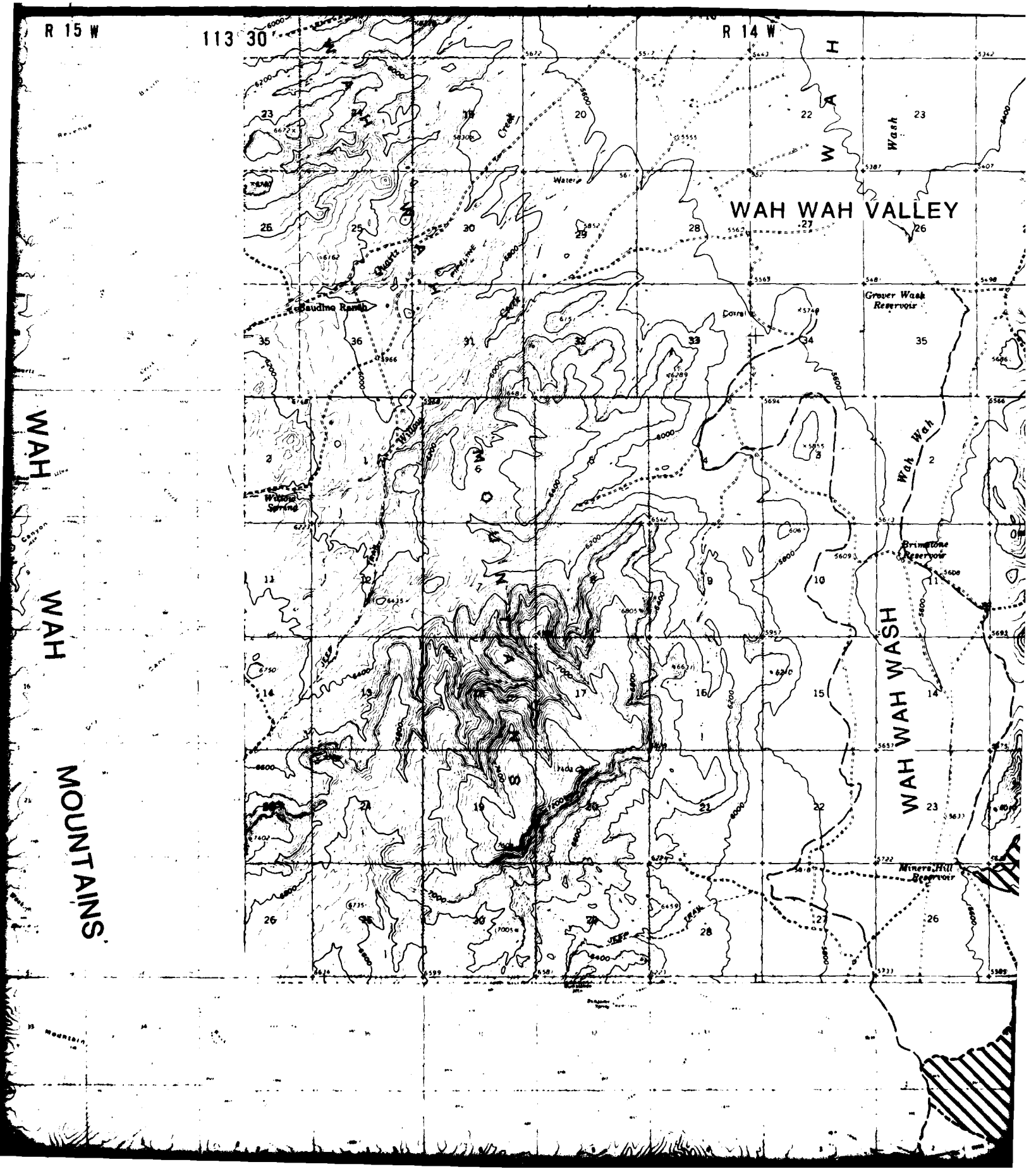


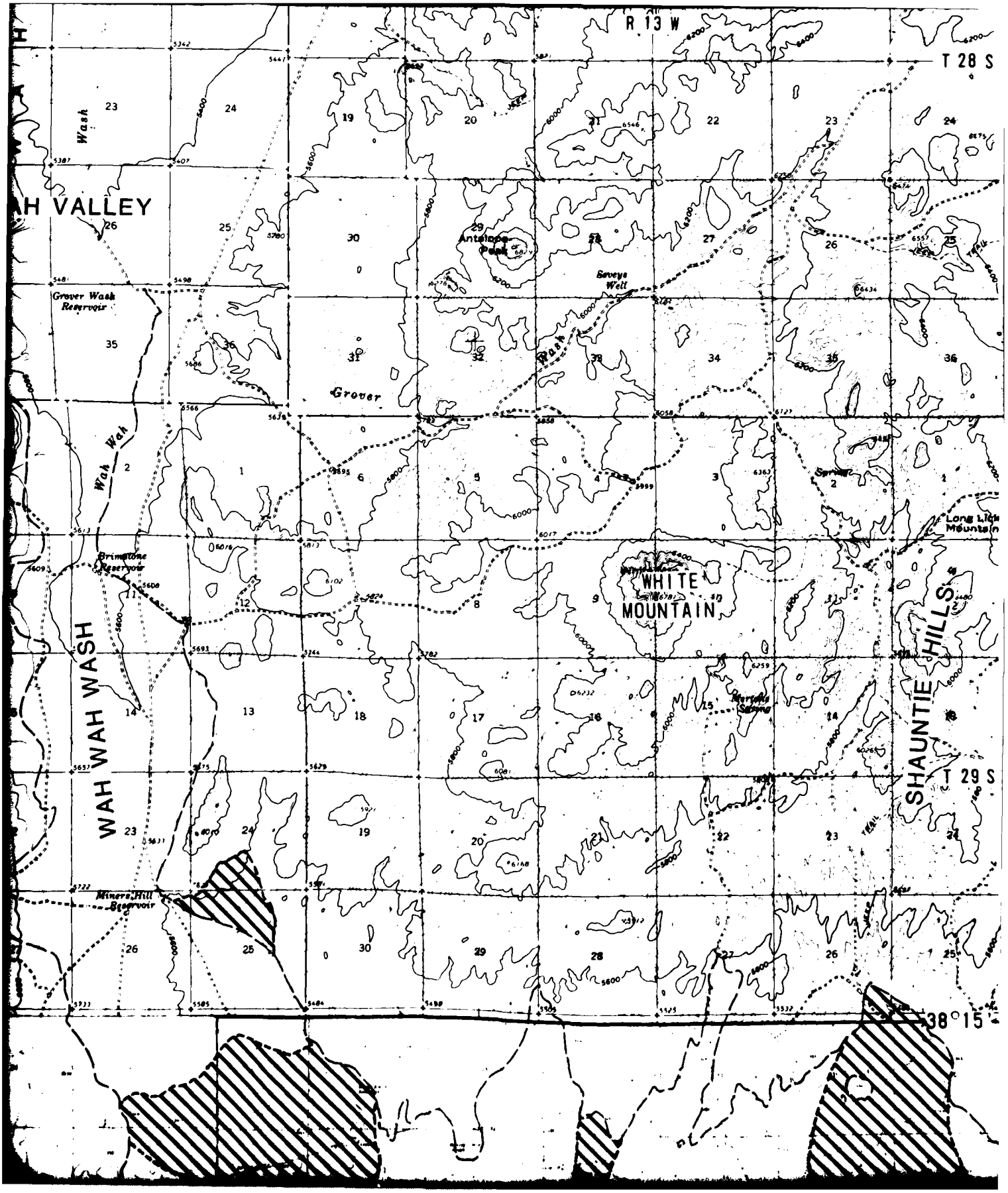
LAND STATUS MAP

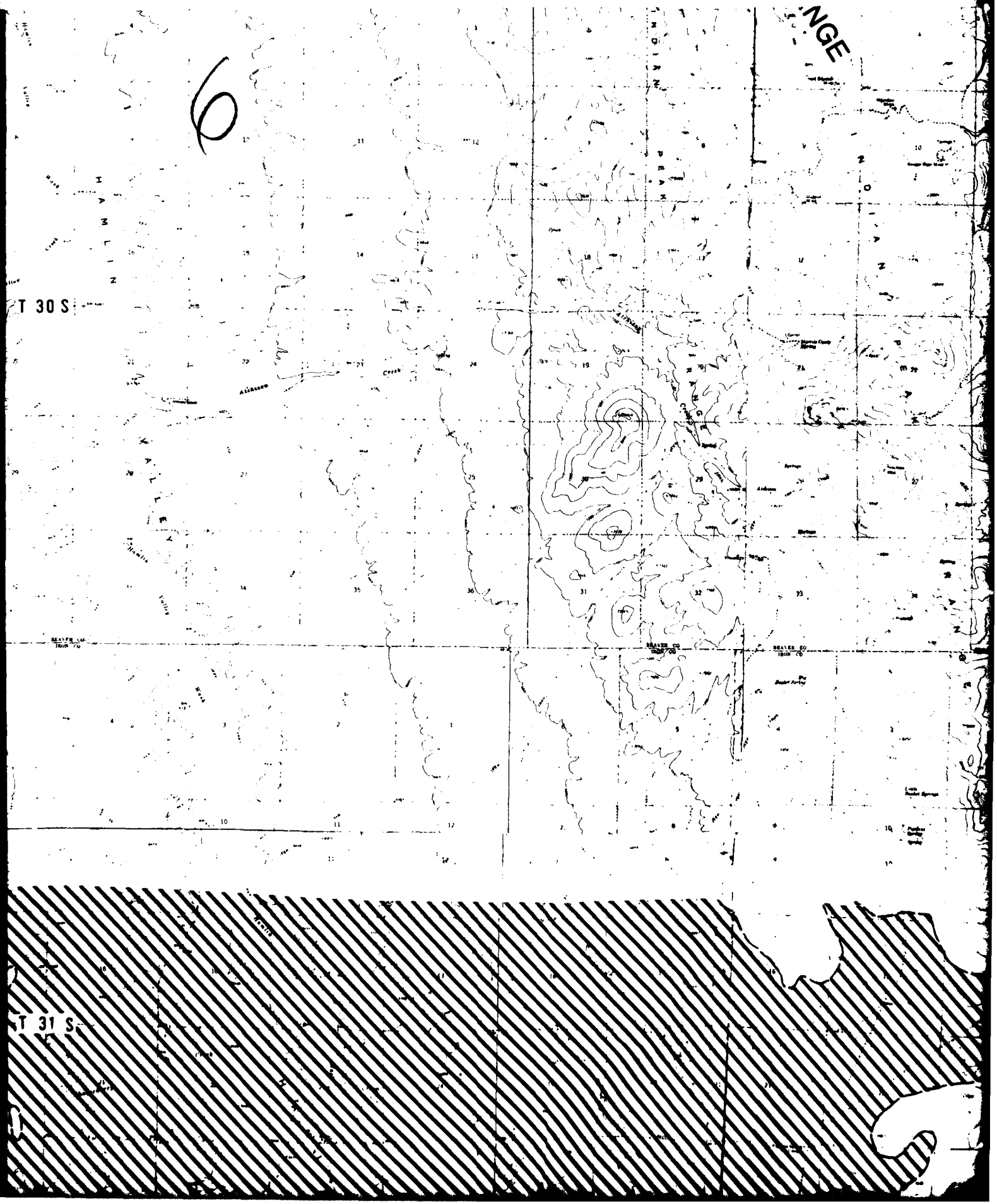

R 19 W
R 18 W
T 28 S
T 29 S
INDIAN
PEAK


R 17 W
113°45'
PINE VALLEY
INDIAN PEAK
GAME MANAGEMENT AREA

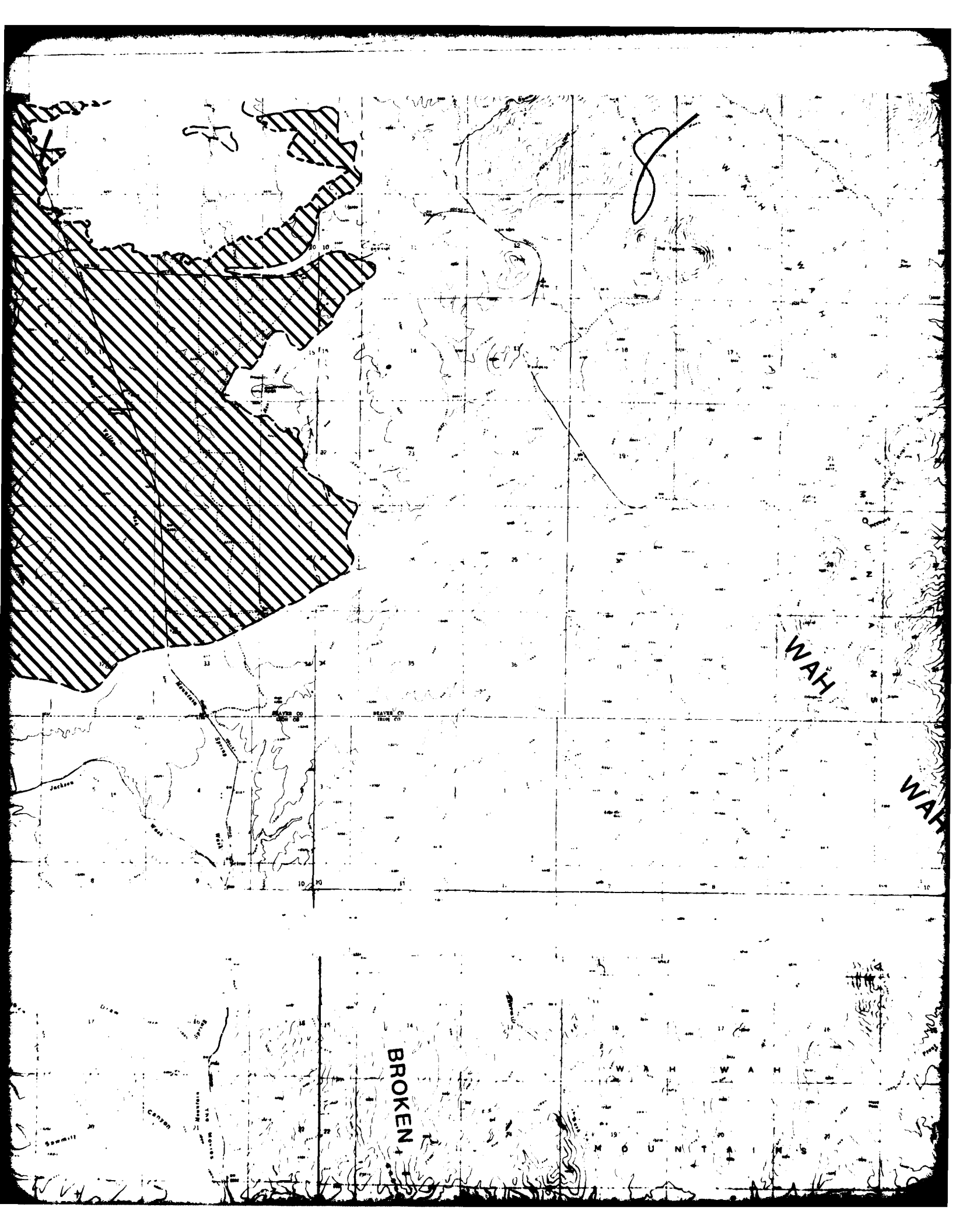

WAH
WAH
WAH WAH
MOUNTAINS
R 16 W


R 15 W
113 30'
R 14 W
WAH WAH VALLEY
WAH WAH MOUNTAINS
WAH WAH WASH
Quartz Creek
Pinto Creek
Willow Creek
Wah Wah
Grouer Wash Reservoir
Brimstone Reservoir
Miners Hill Reservoir
Willow Spring
Baudine Ranch
Corral
Water
Pinto
Jeep
Trail

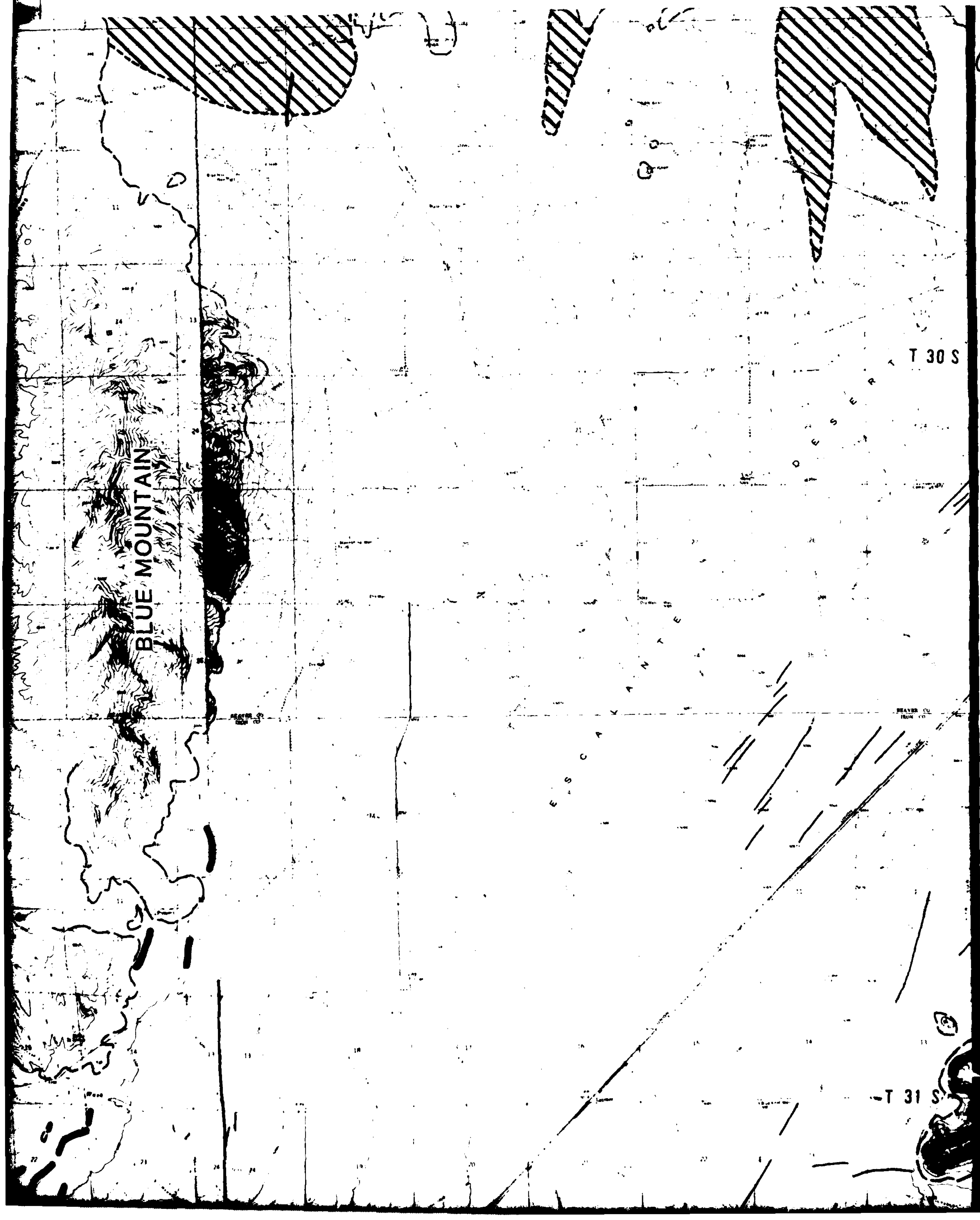

R 13 W
T 28 S
T 29 S
38°15'
H VALLEY
Wash
Antelope Peak
Seveya Well
Grover Wash Reservoir
Grover
Wah Wah
Brimstone Reservoir
WHITE MOUNTAIN
WAH WAH WASH
SHAUNTIE HILLS
Long Lick Mountain
Spring
Miners Hill Reservoir
TRAIL

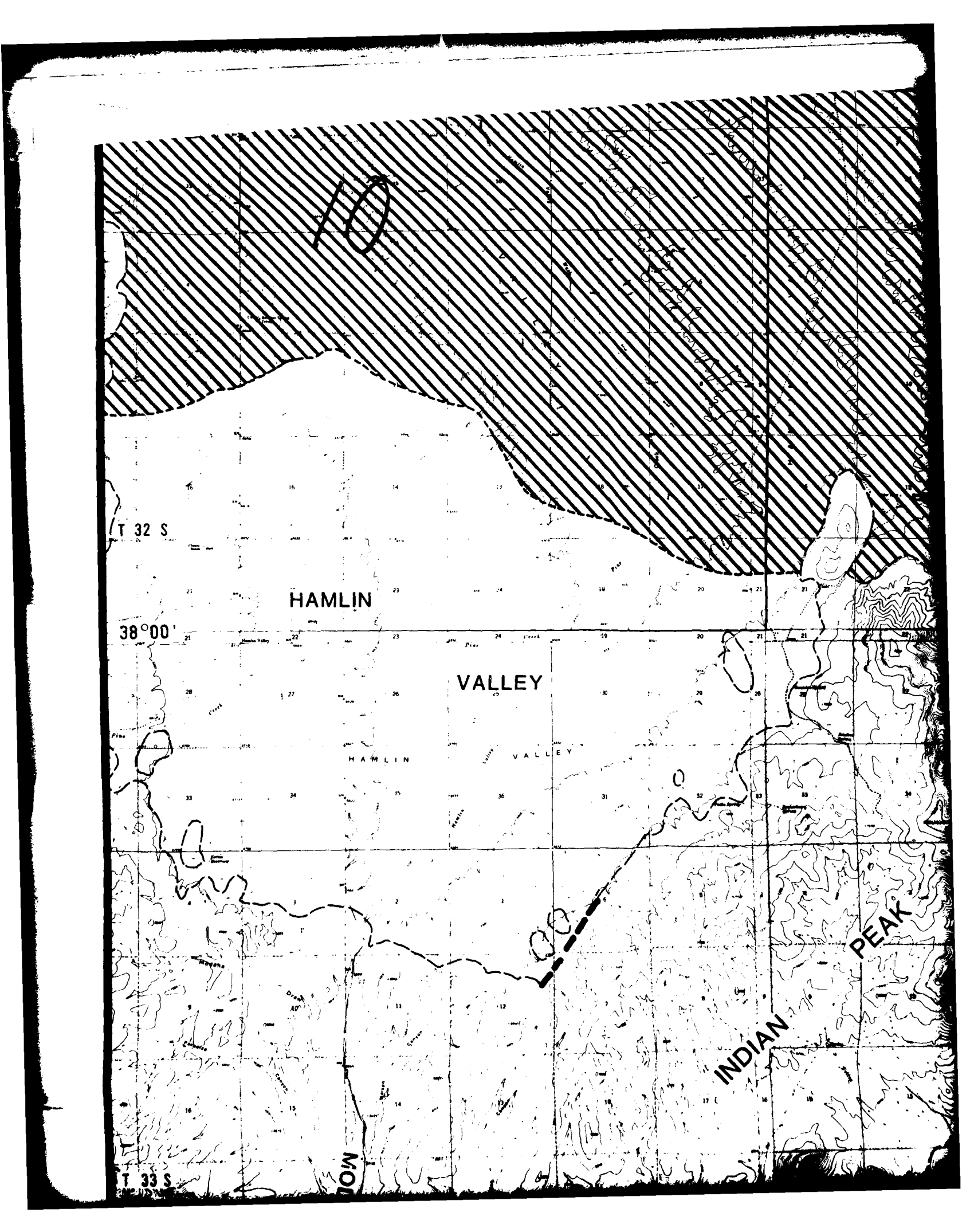

6
T 30 S
T 31 S

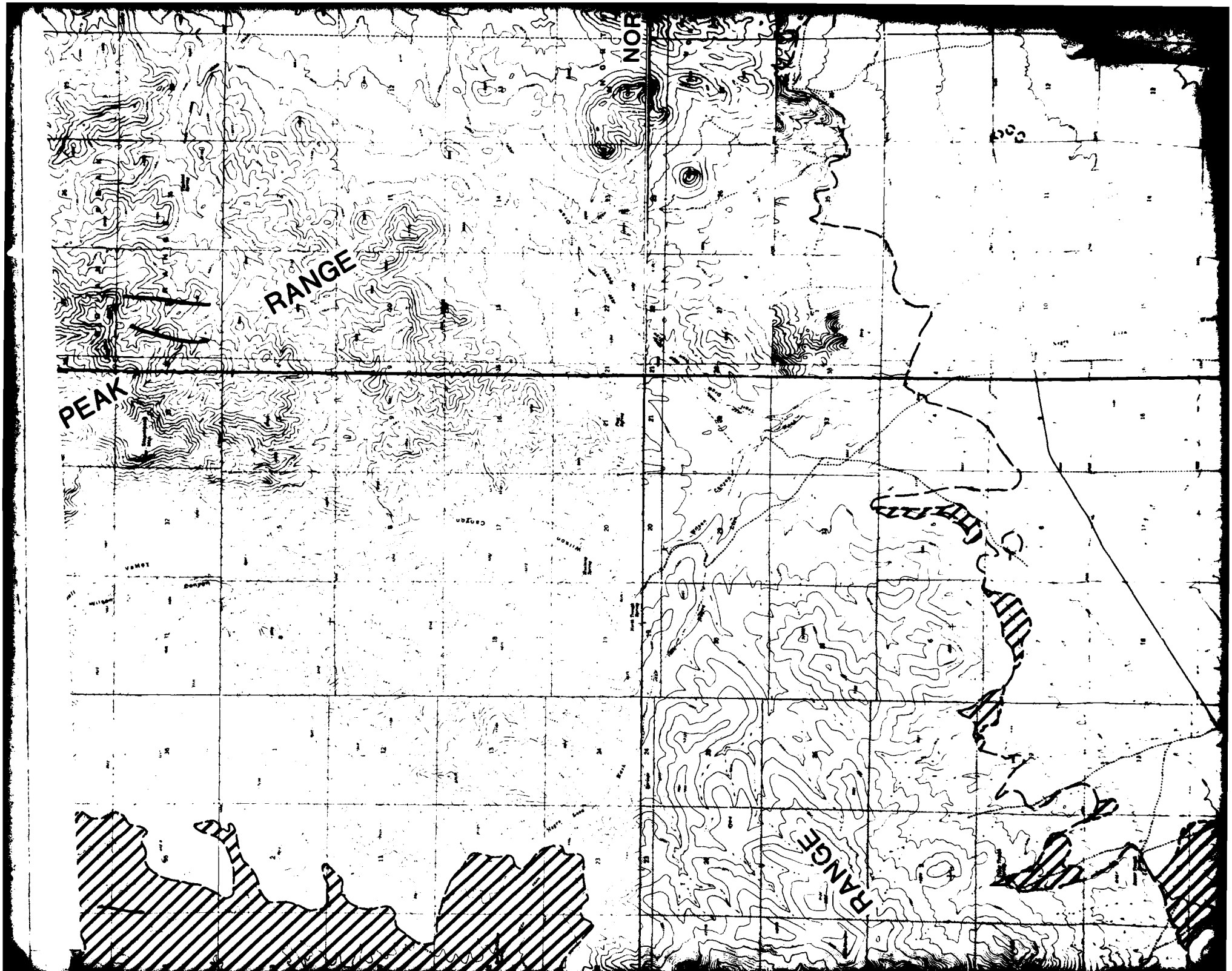

INDIAN

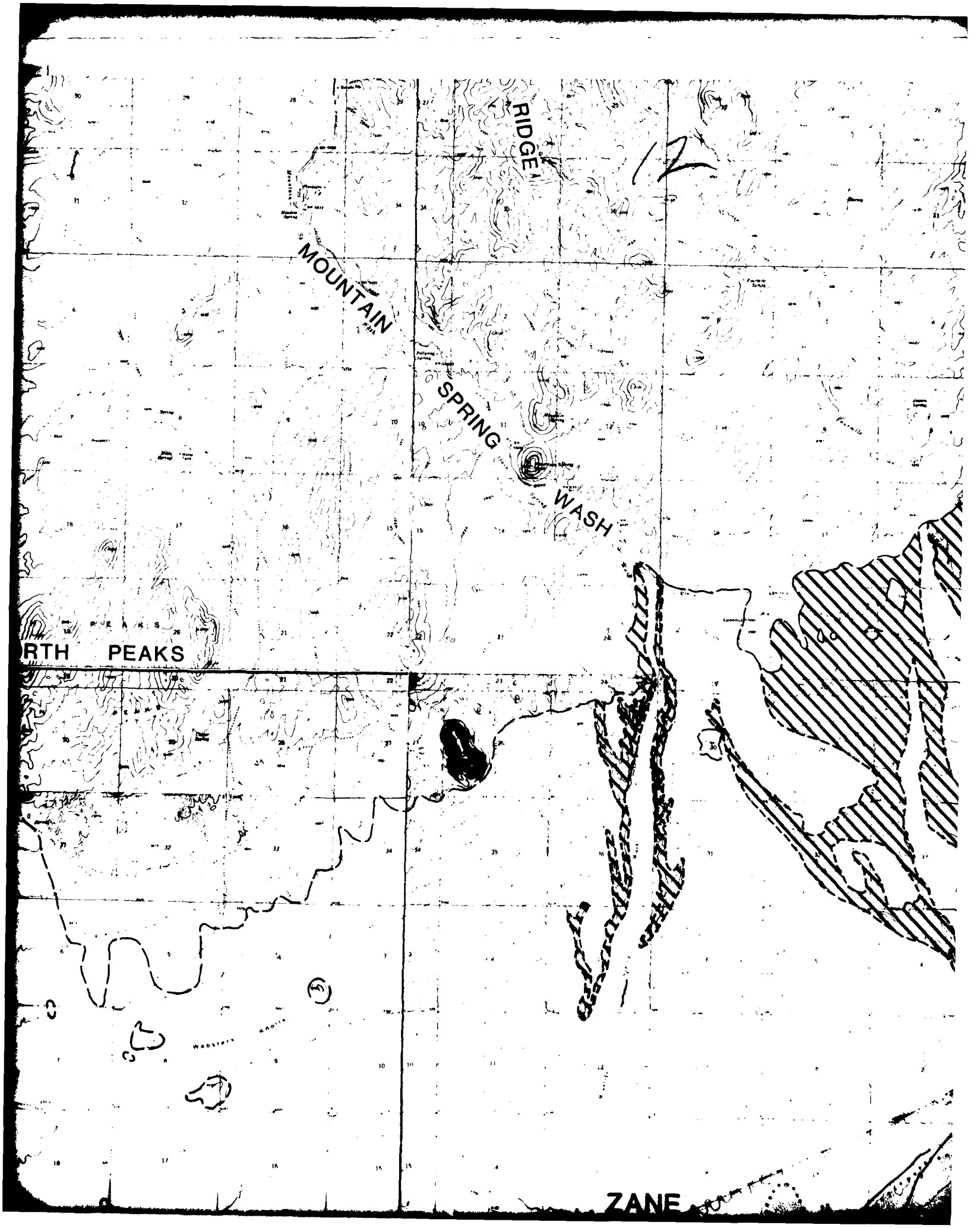

WAH
WAH
BROKEN
W A H W A H
M O U N T A I N S

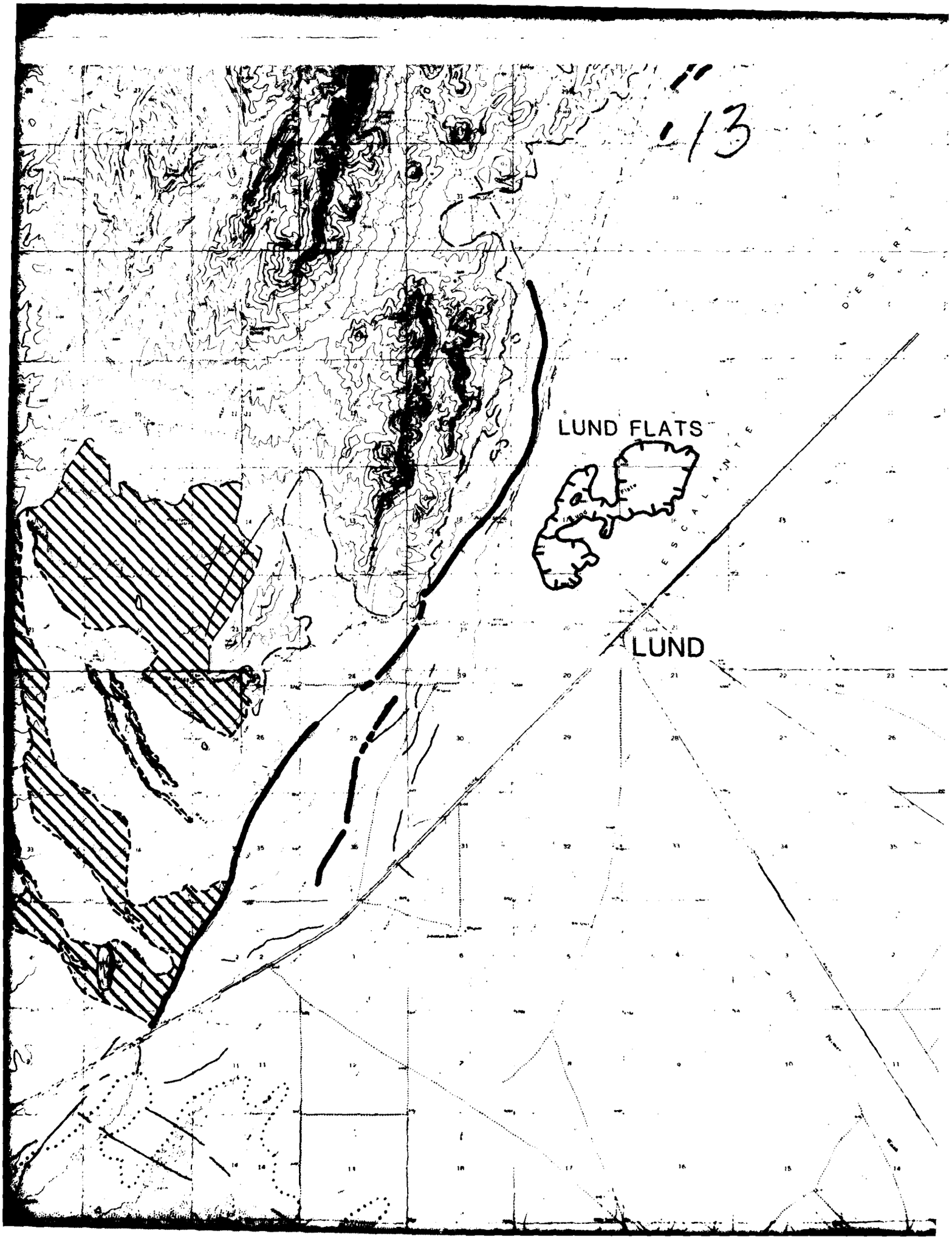

SOUTH WAH MOUNTAINS
BLUE MOUNTAIN
WAH
MOUNTAINS


BLUE MOUNTAIN
ESCALANTE DESERT
T 30 S
T 31 S


T 32 S
HAMLIN
38°00'
VALLEY
HAMLIN VALLEY
INDIAN PEAK
T 33 S

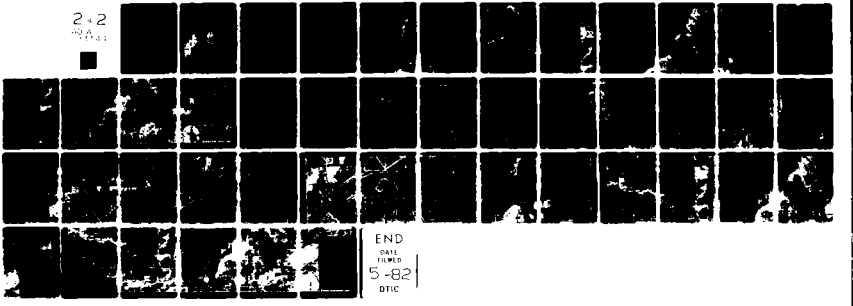

NOR
RANGE
PEAK
RANGE


RIDGE
MOUNTAIN
SPRING
WASH
PEAKS
RTH PEAKS
ZANE

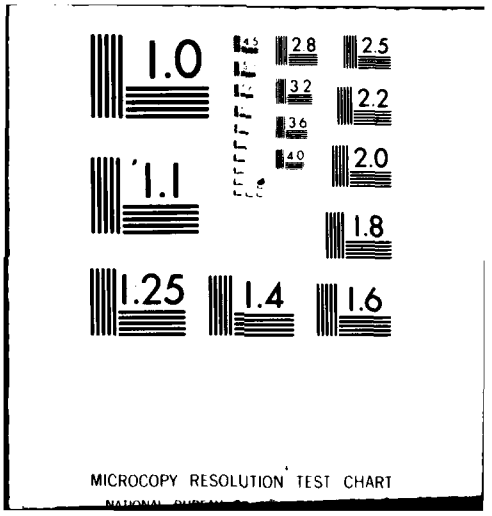

13
LUND FLATS
LUND
ESCALANTE
DESERT

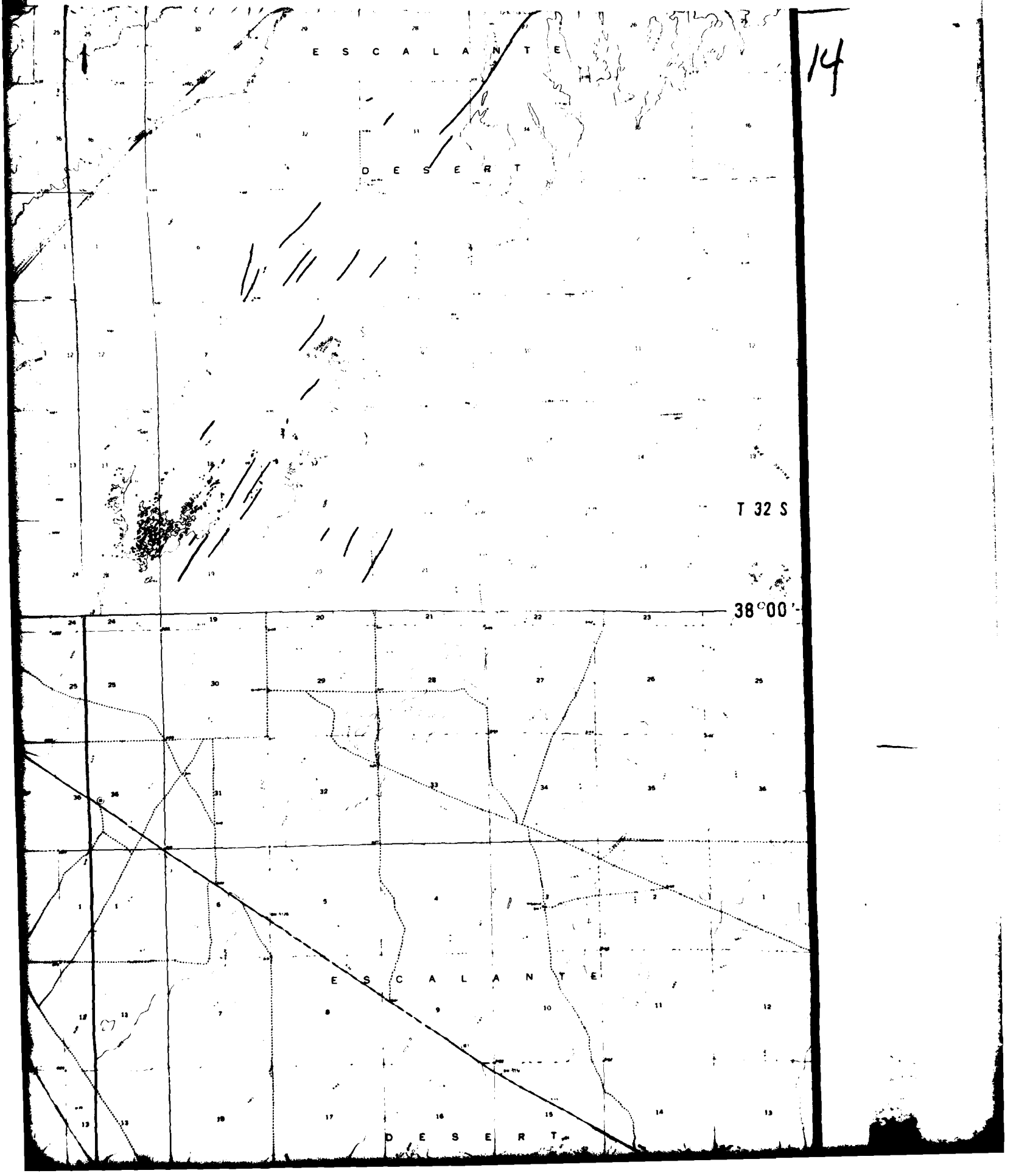
AD-A113 344 FUGRO NATIONAL INC LONG BEACH CA F/G 13/2
PROPOSED OPERATIONAL BASE SITE, ESCALANTE DESERT, BERYL AREA, U--ETC(U)
JUN 80 F04704-80-C-0006
UNCLASSIFIED FN-TR-35-5 NL

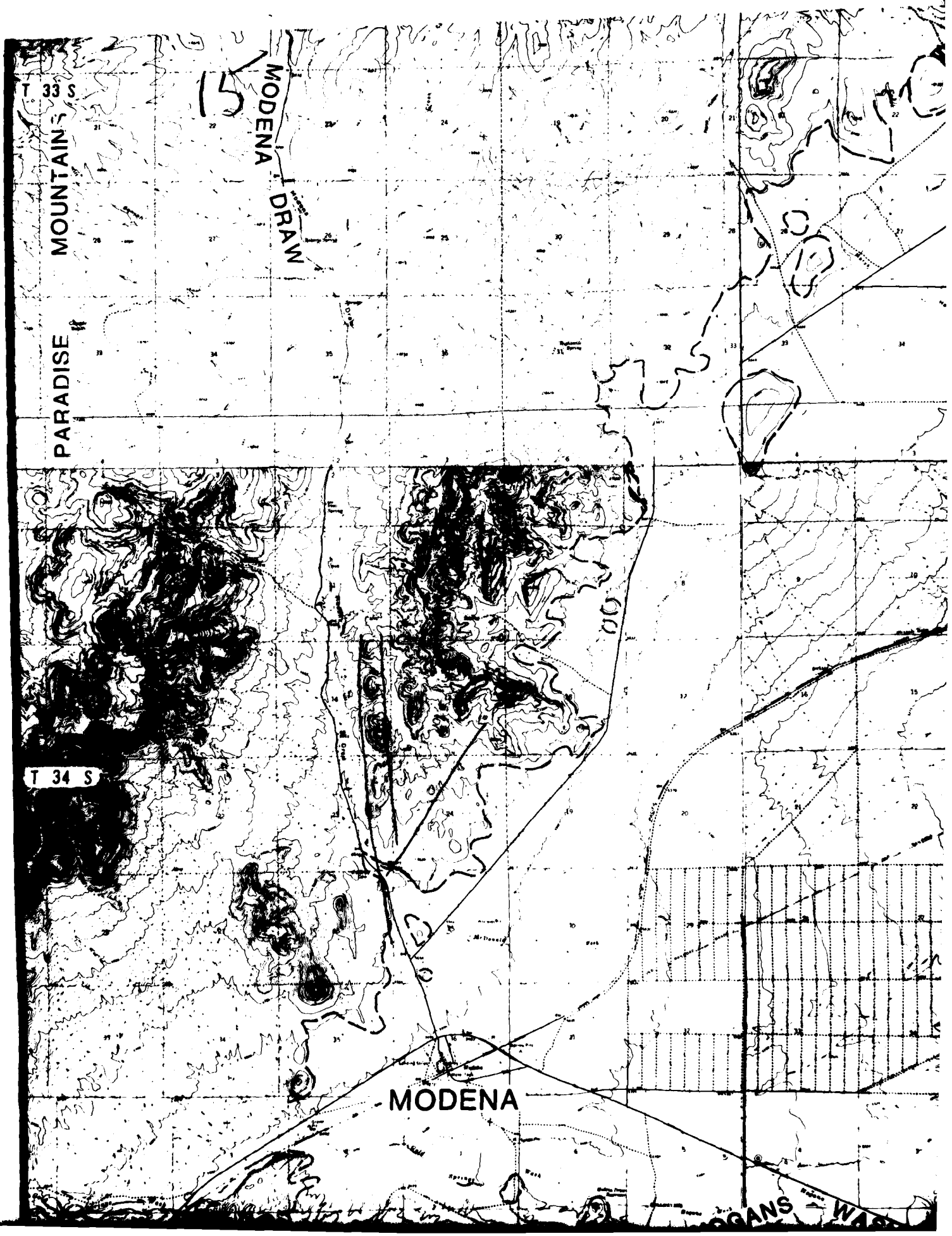
2 + 2

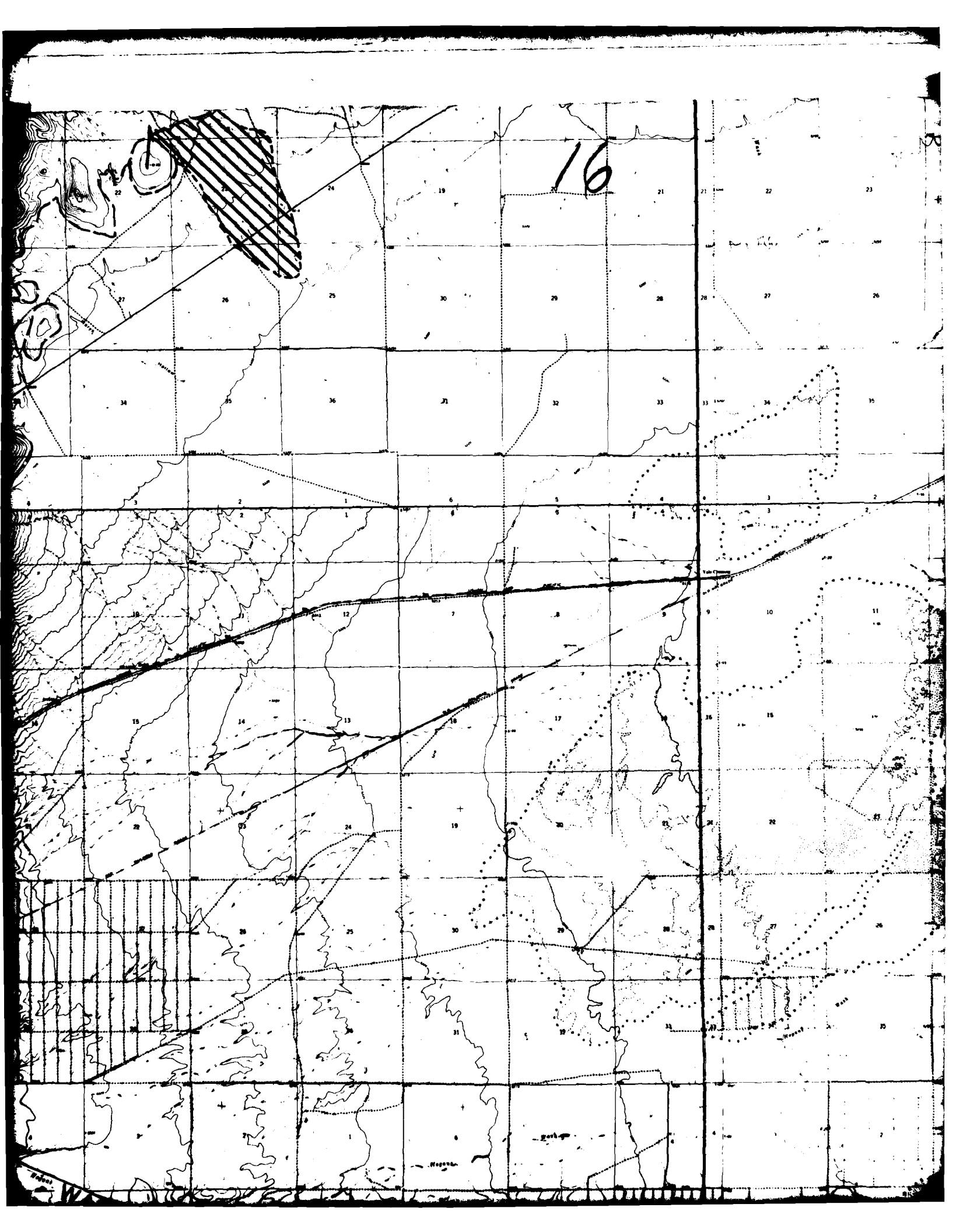


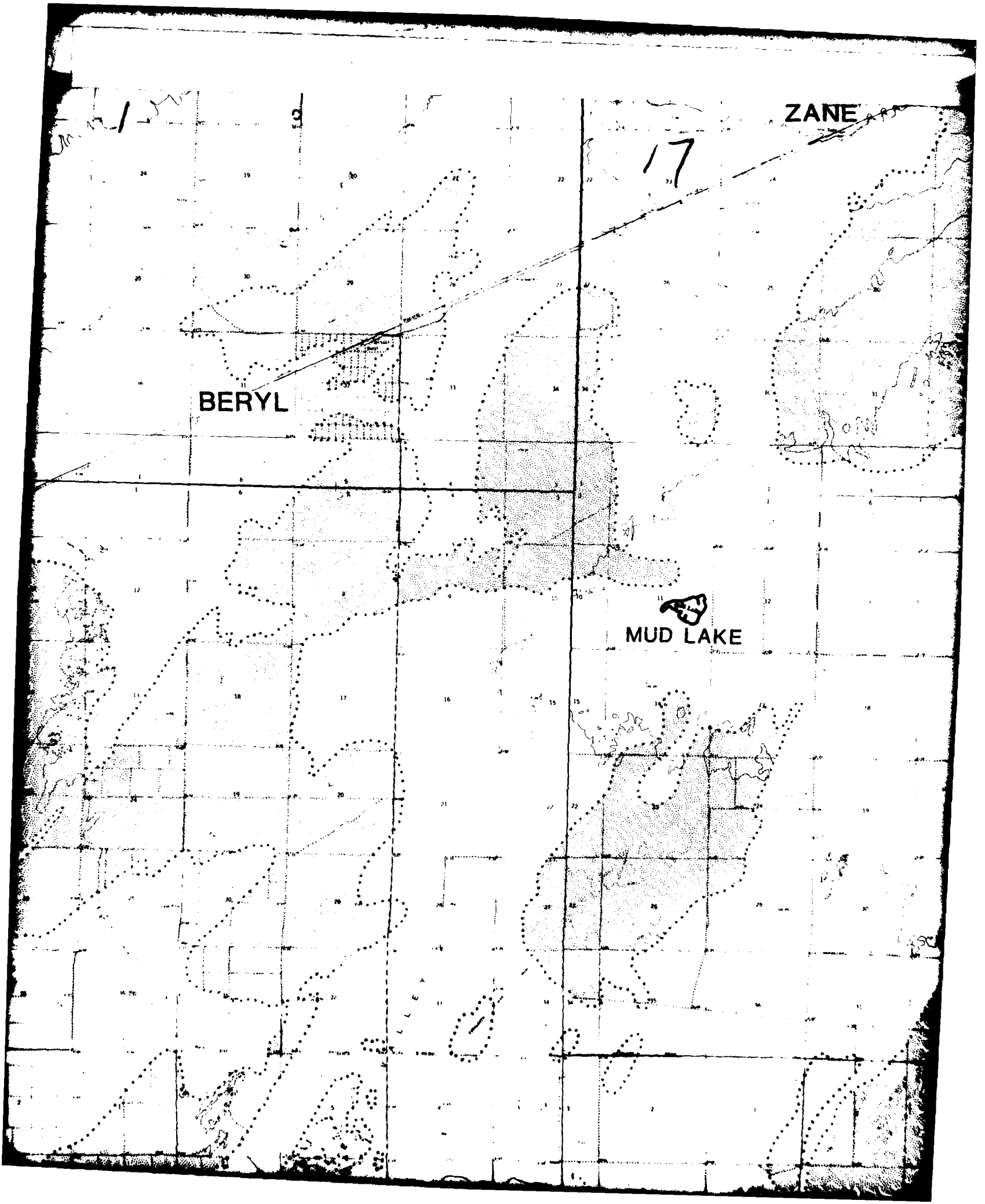
END
DATE FILMED
5-82
DTIC


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
MICROCOPY RESOLUTION TEST CHART


14
E S C A L A N T E
D E S E R T
T 32 S
38°00'
E S C A L A N T E
D E S E R T


T 33 S
15
MODENA DRAW
MOUNTAIN
PARADISE
T 34 S
MODENA


16


ZANE
17
BERYL
MUD LAKE

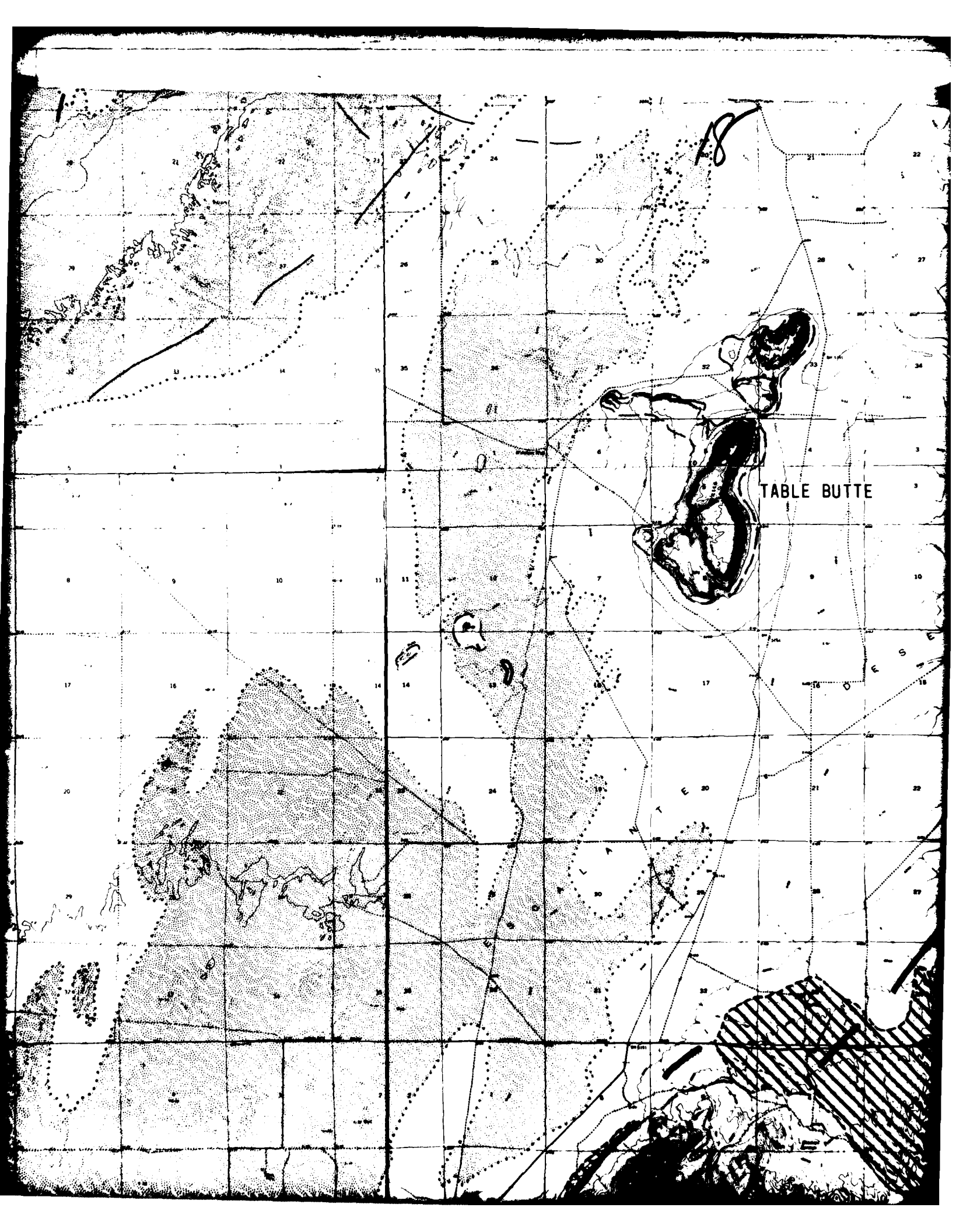
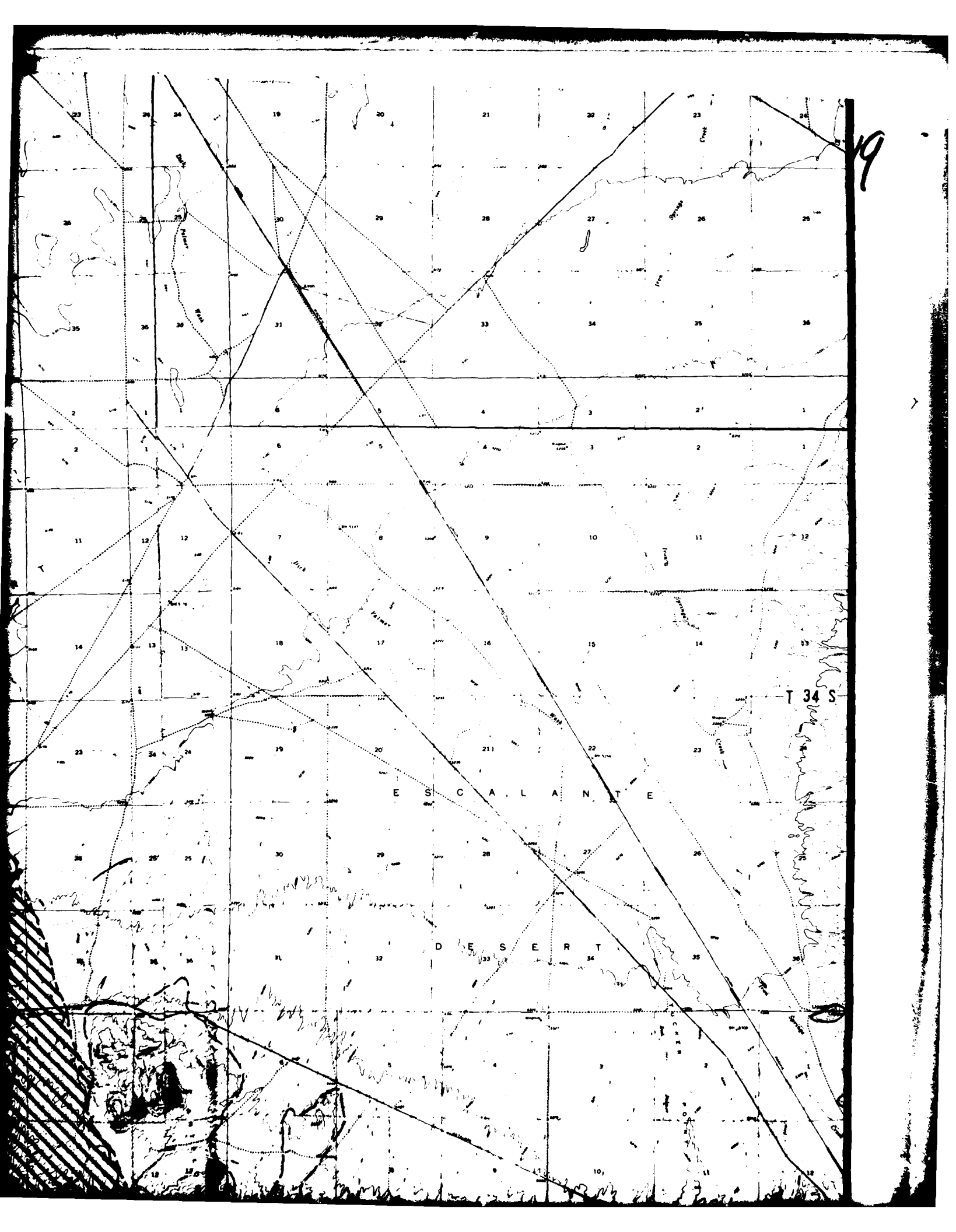
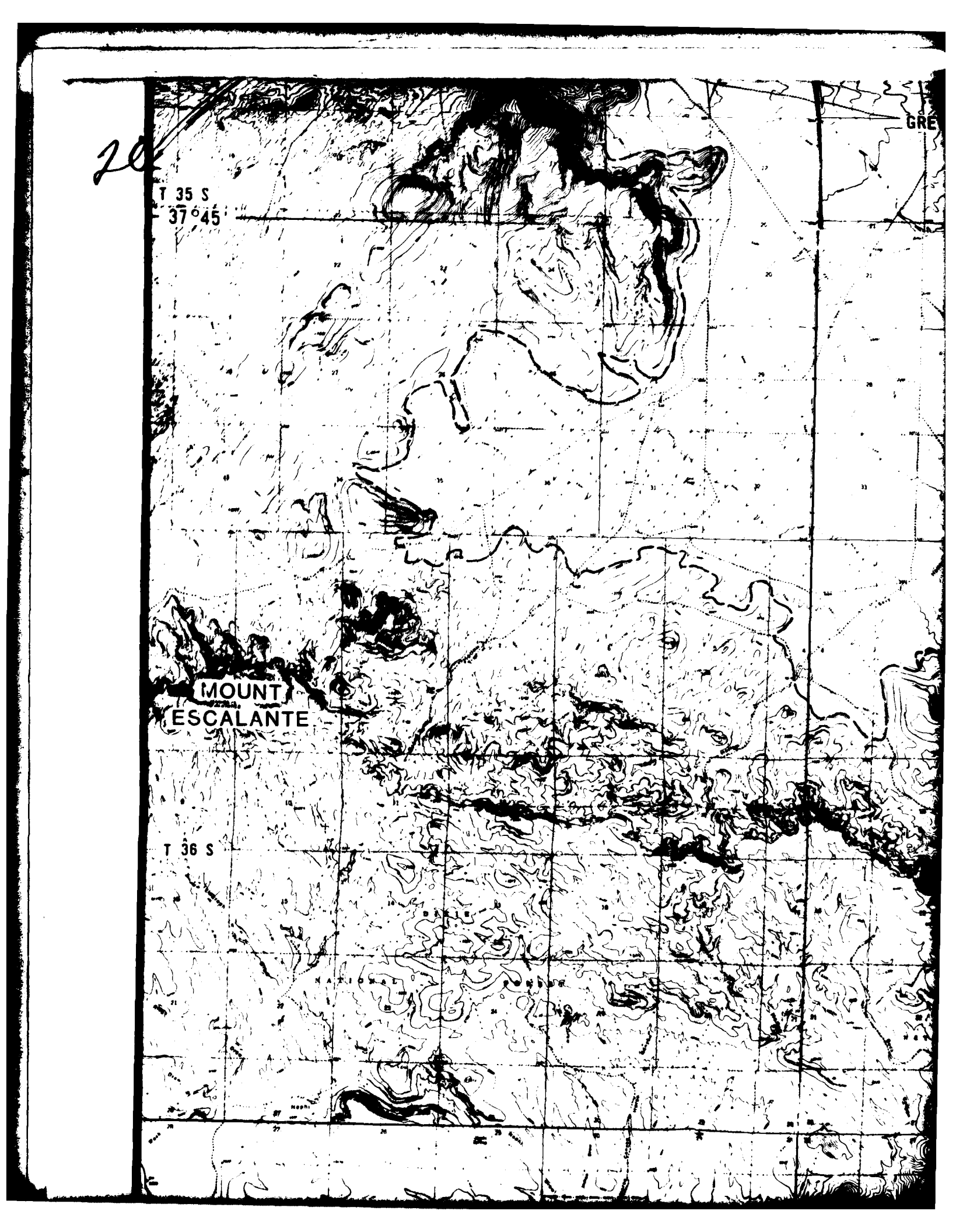
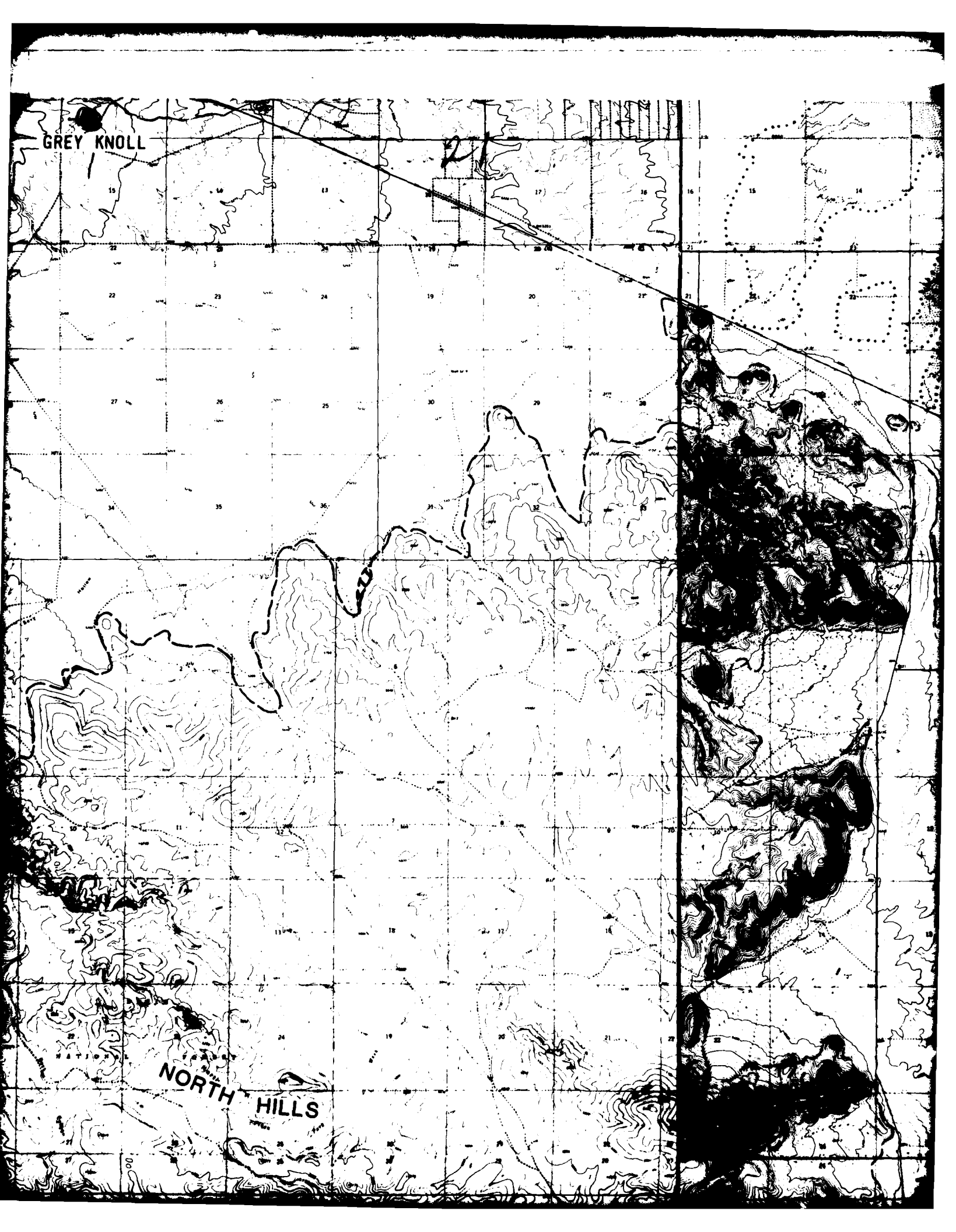
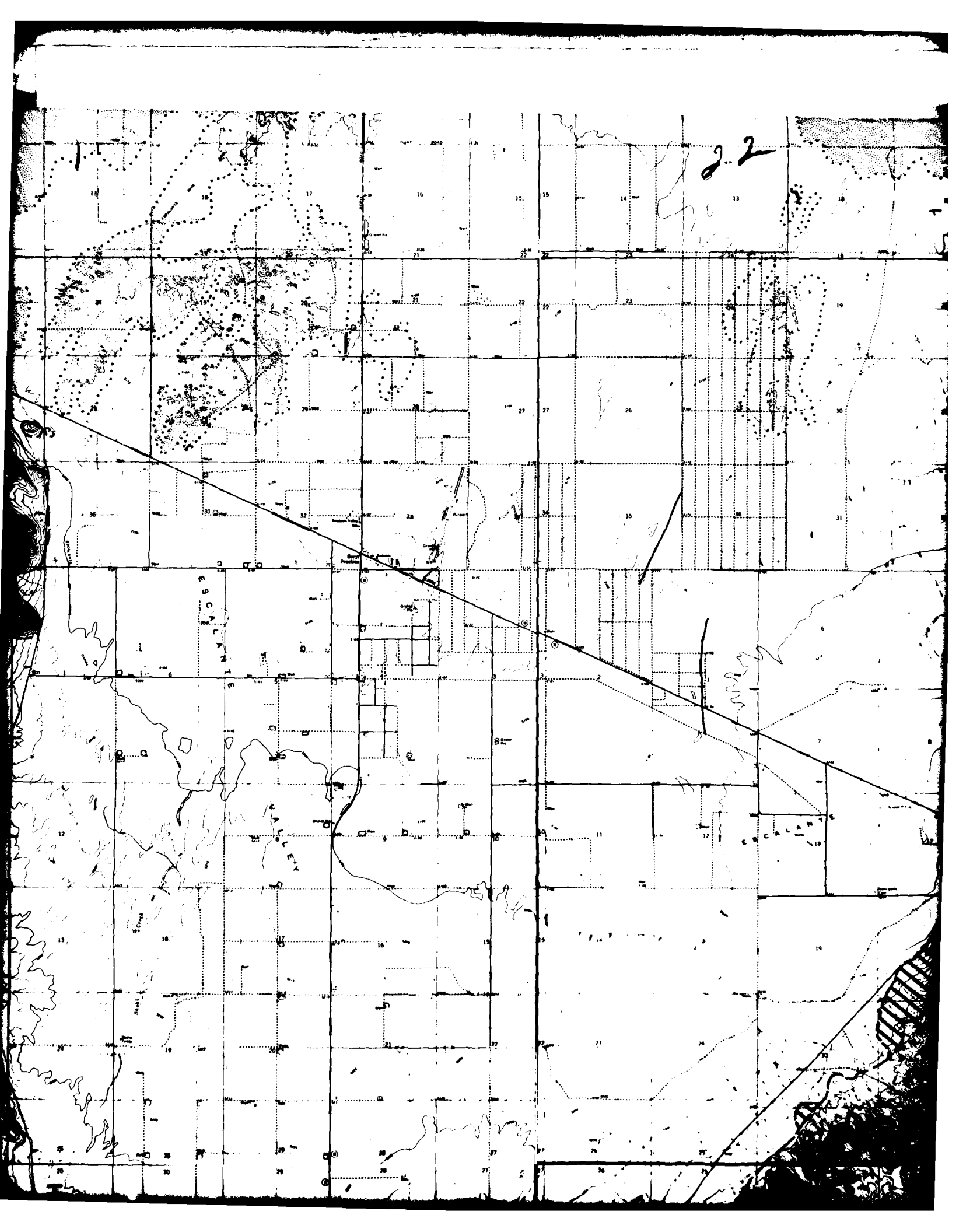


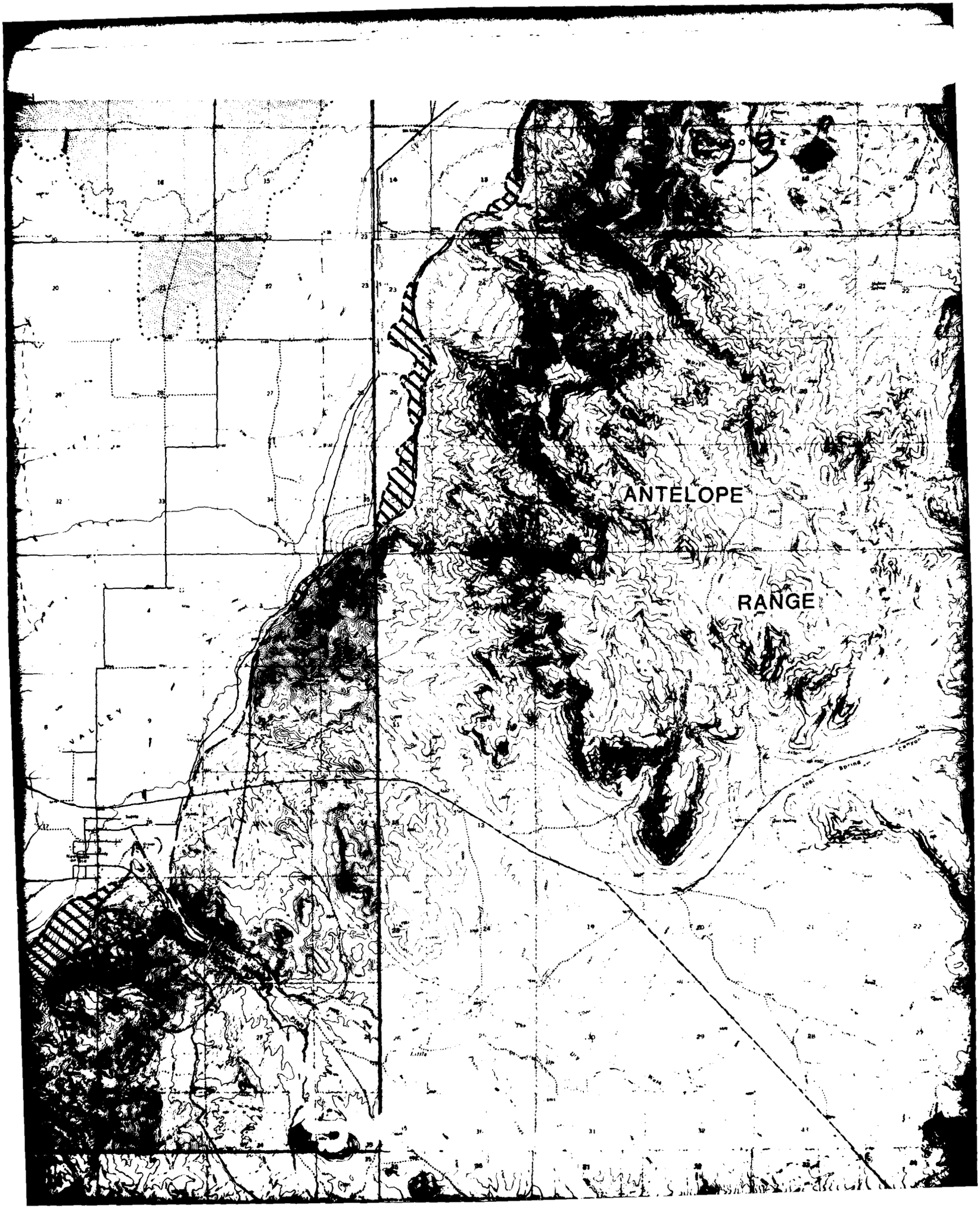
TABLE BUTTE


T 34 S
E S C A L A N T E
D E S E R T

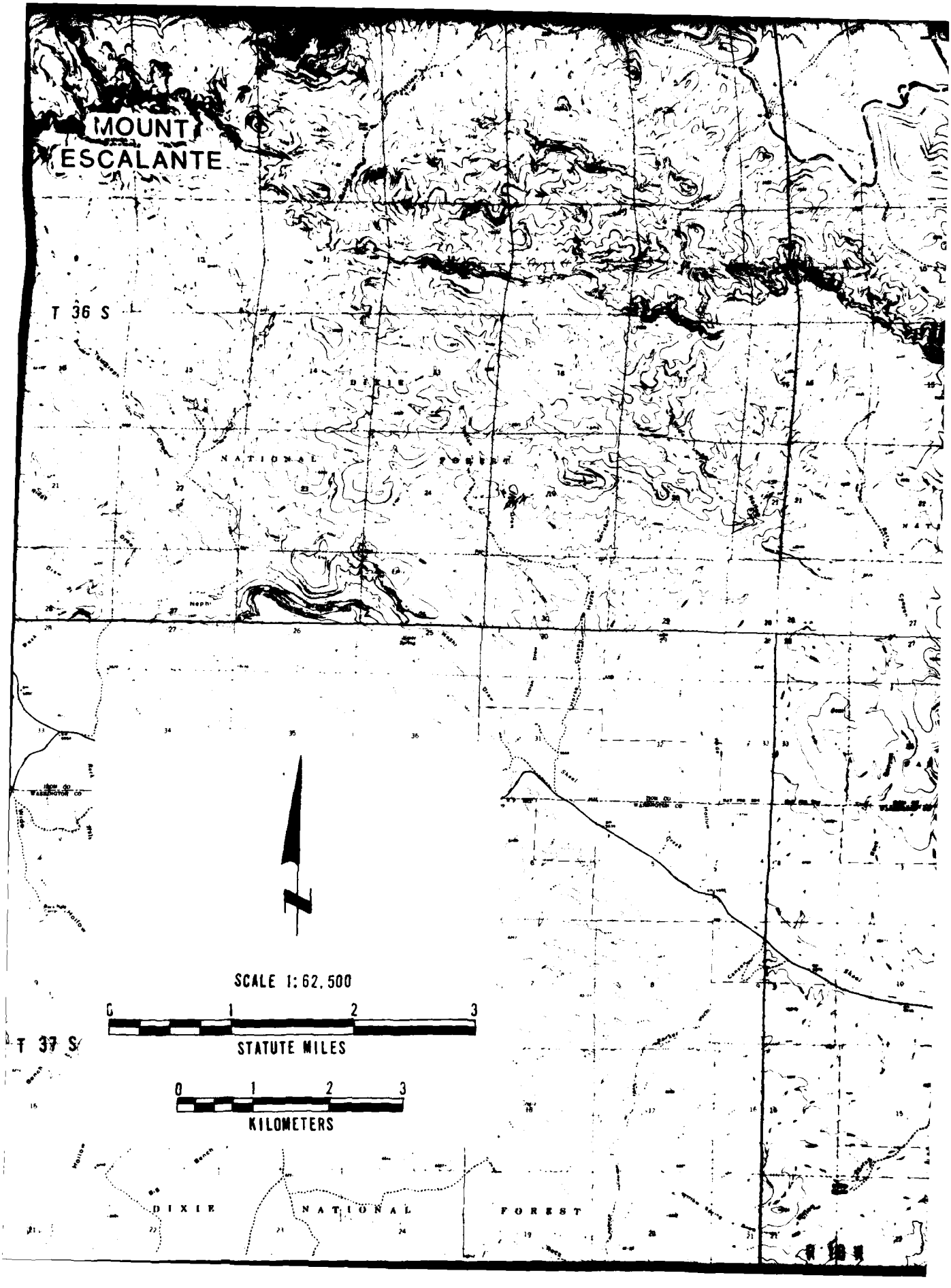

T 35 S
37°45'
MOUNT
ESCALANTE
T 36 S

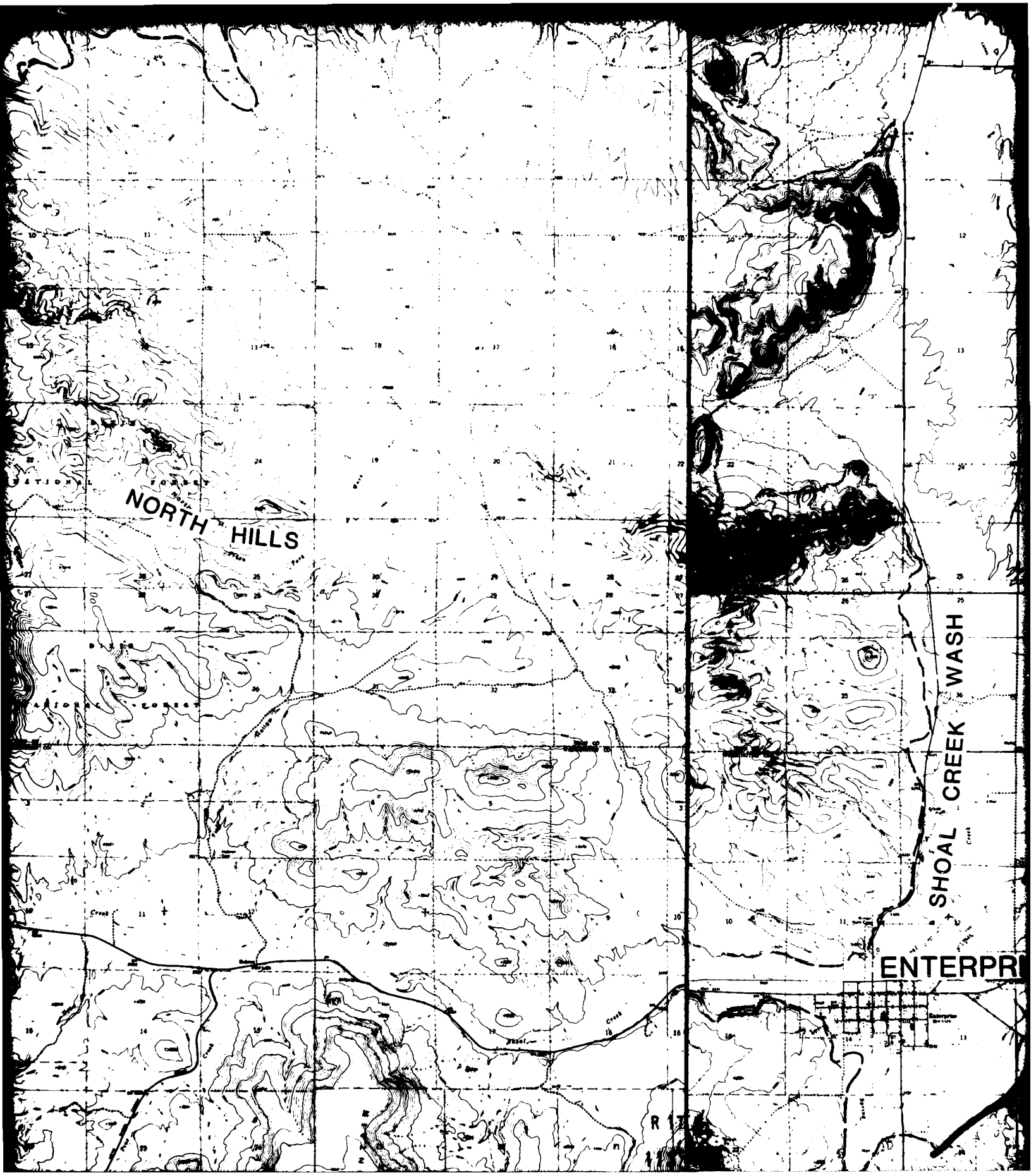

GREY KNOLL
NORTH HILLS

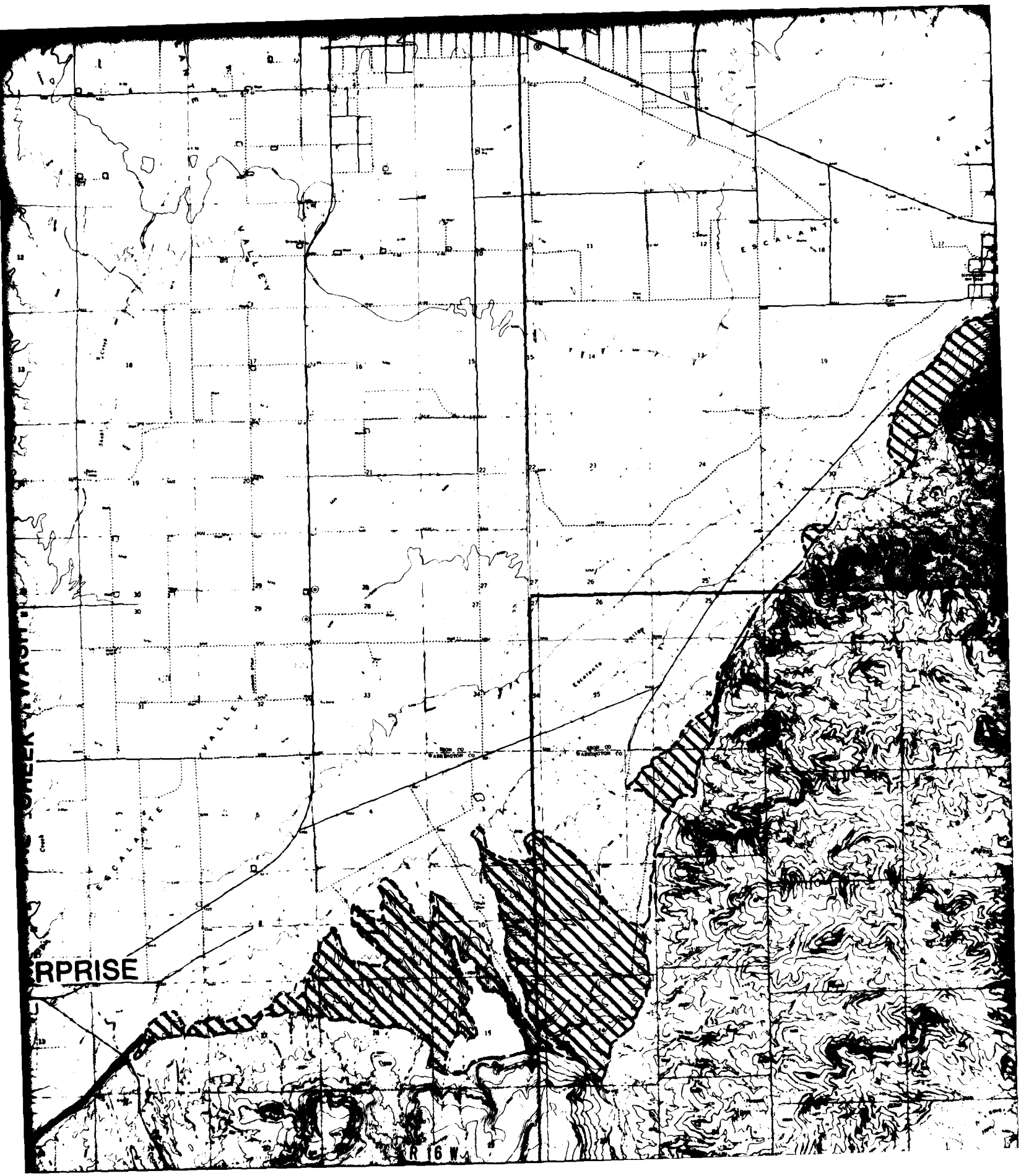

2.2
ESCALANTE
ESCALANTE

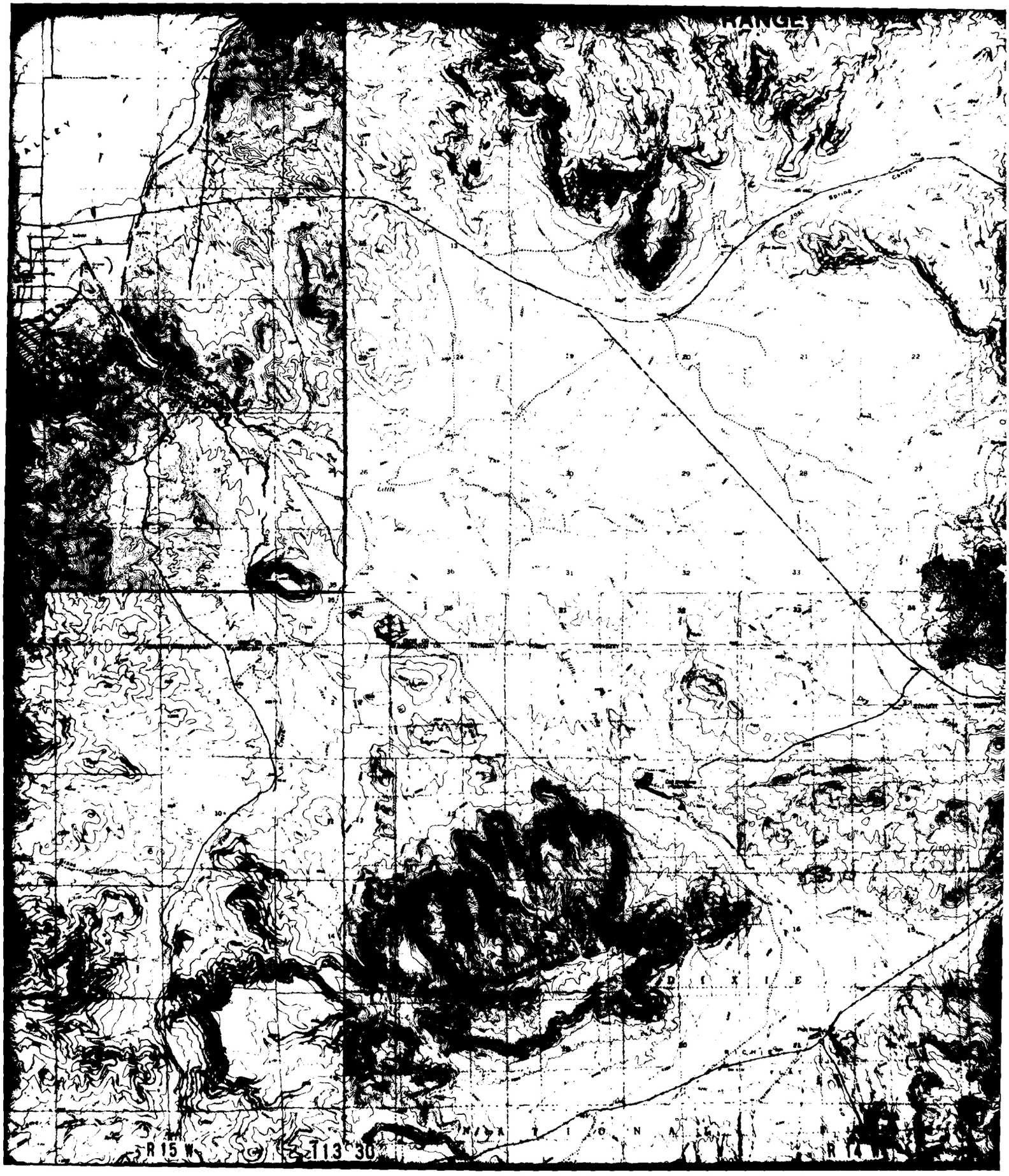

ANTELOPE
RANGE

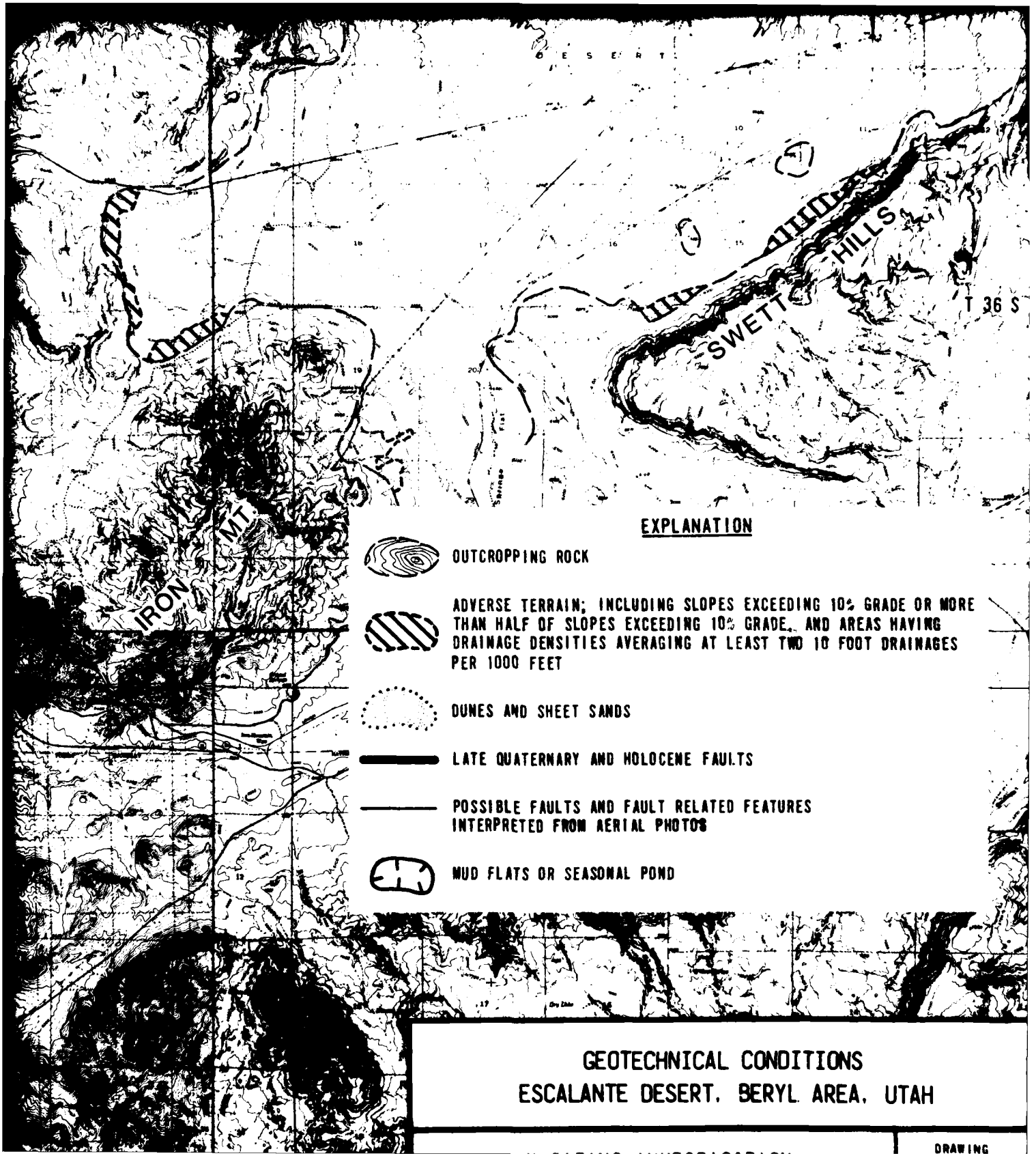
24
T 35 S
37°45'
ESCALANTE DESERT
NECK OF THE DESERT
SWETT HILLS
T 36 S
IRON MT.
EXPLANATION
OUTCROPPING ROCK
ADVERSE TERRAIN; INCLUDING SLOPES EXCEEDING 10% GRADE OR MORE THAN HALF OF SLOPES EXCEEDING 10% GRADE, AND AREAS HAVING DRAINAGE DENSITIES AVERAGING AT LEAST TWO 10 FOOT DRAINAGES P R 1000 FEET


MOUNT
ESCALANTE
T 36 S
T 37 S
SCALE 1:62,500
0 1 2 3
STATUTE MILES
0 1 2 3
KILOMETERS
DIXIE NATIONAL FOREST


NORTH HILLS
SHOAL CREEK WASH
ENTERPR
R 1

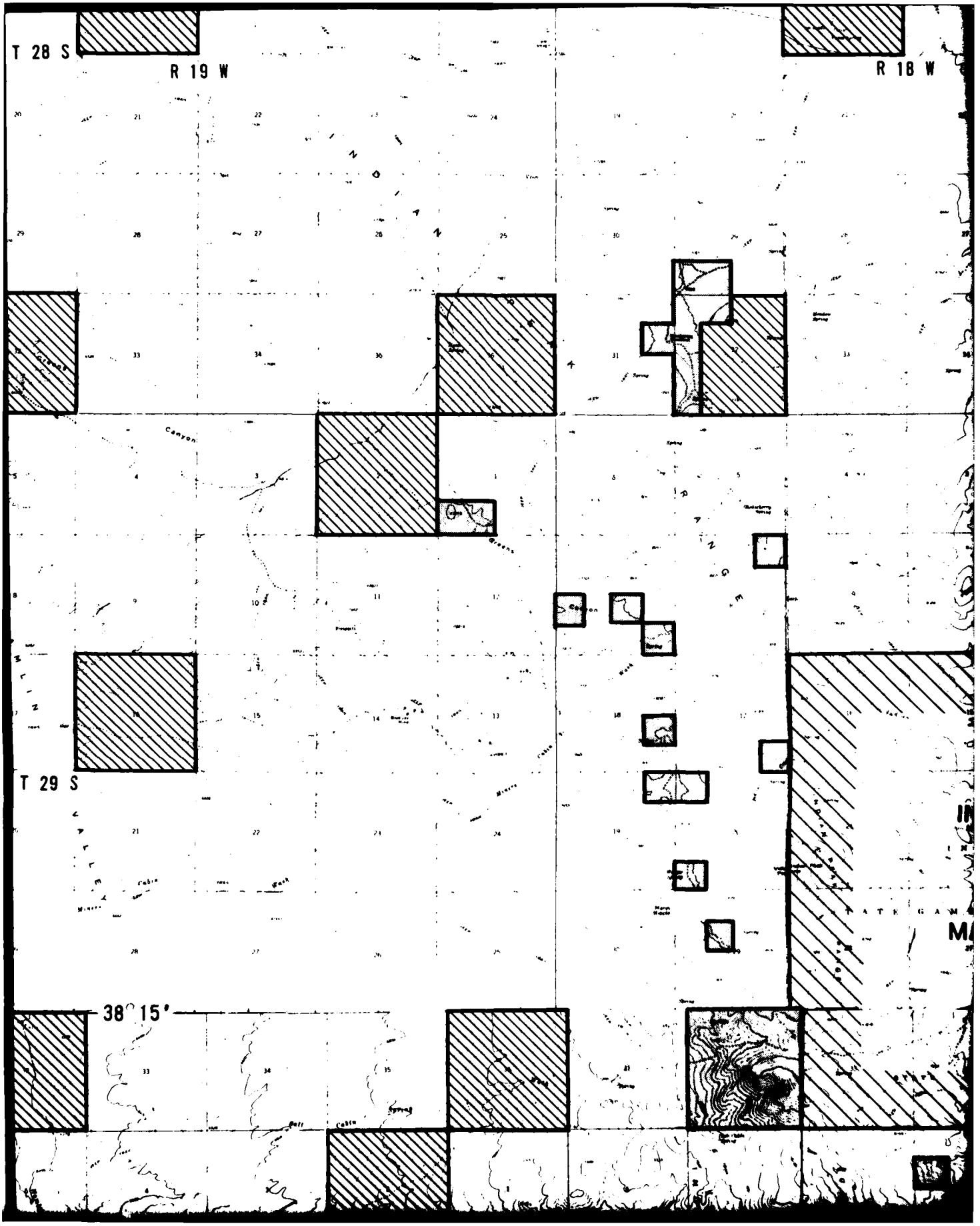

ESCALANTE
R 16 W

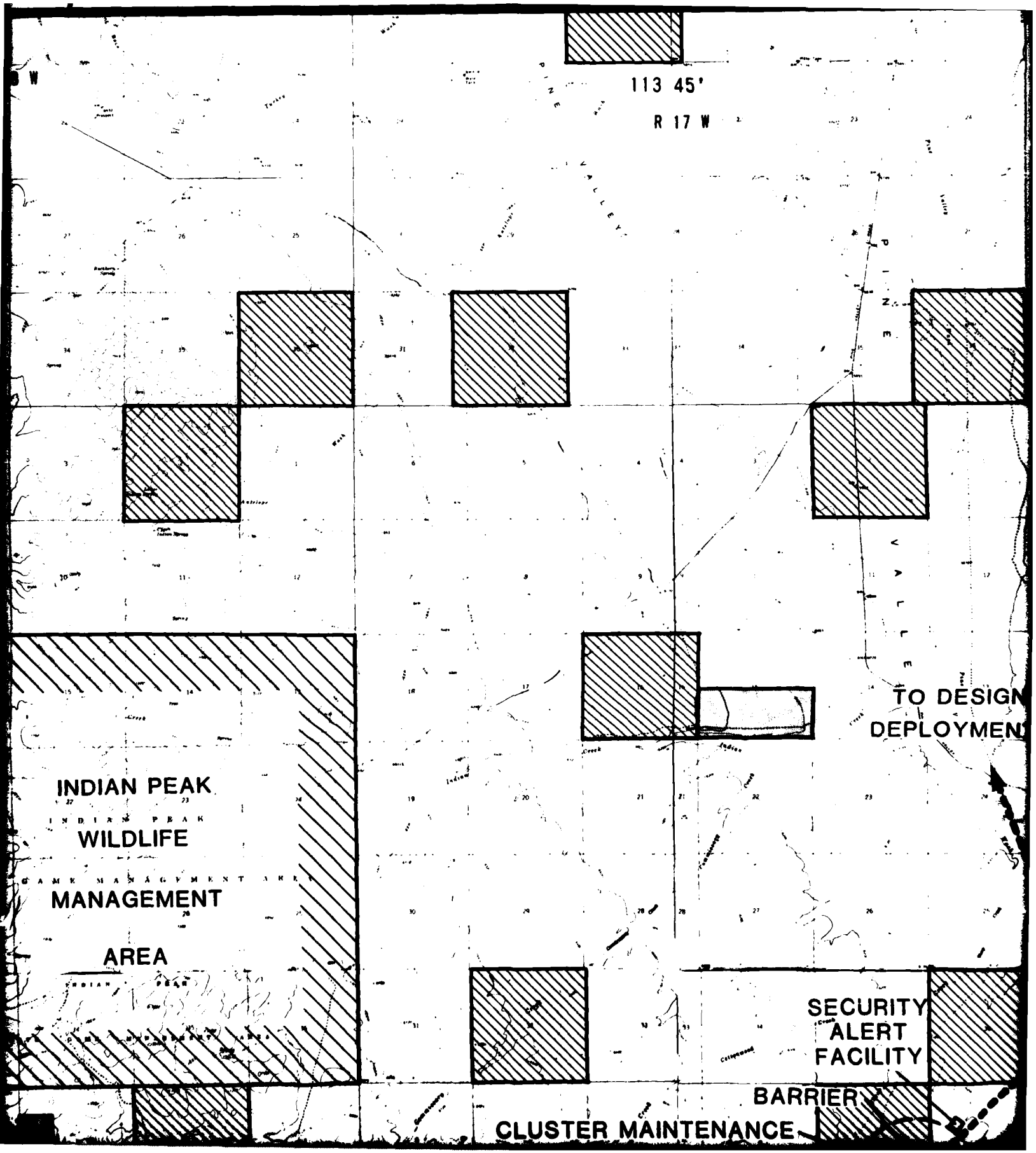

RANGE
DIXIE
R 15 W
T 13 S
R 14

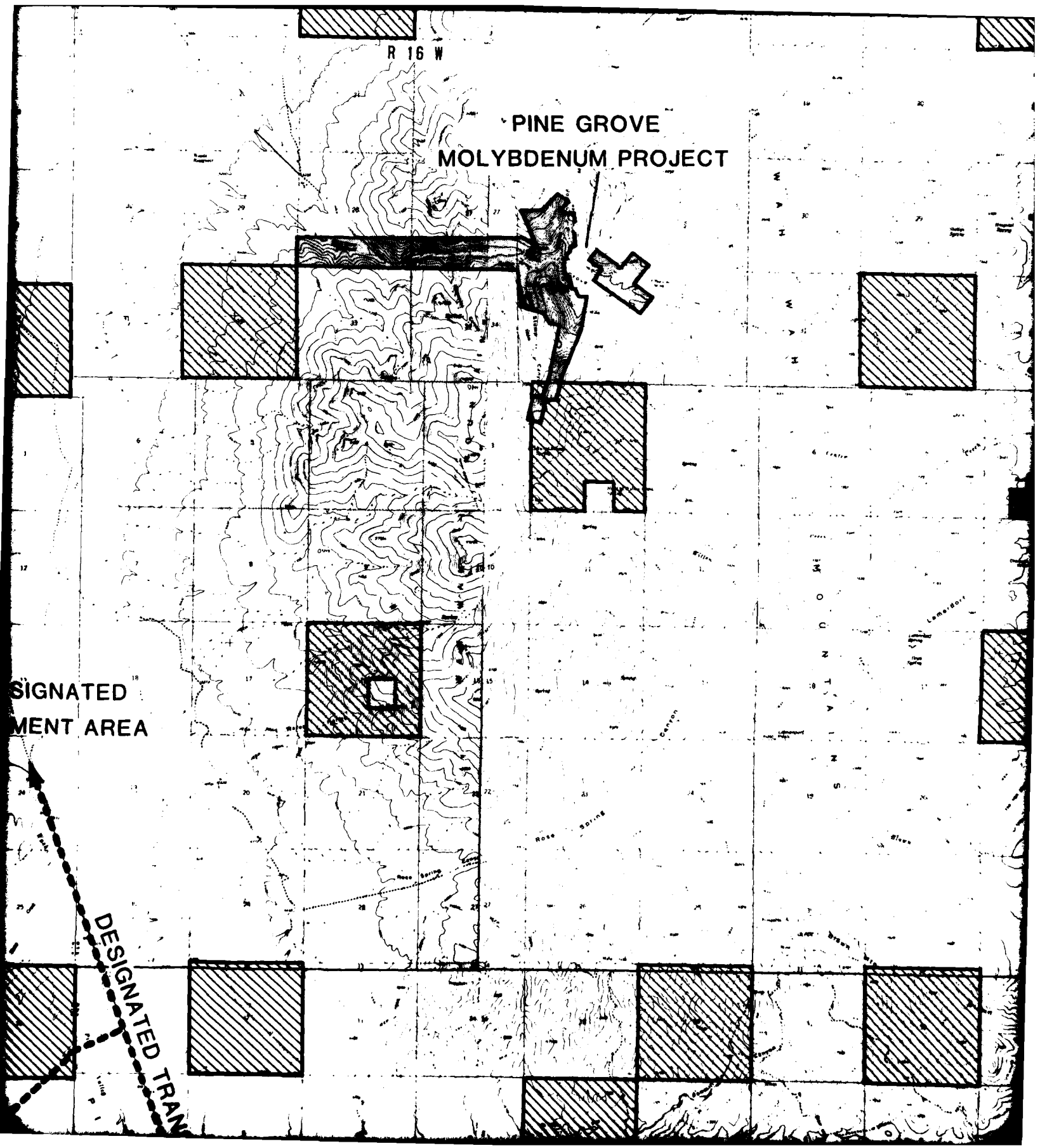


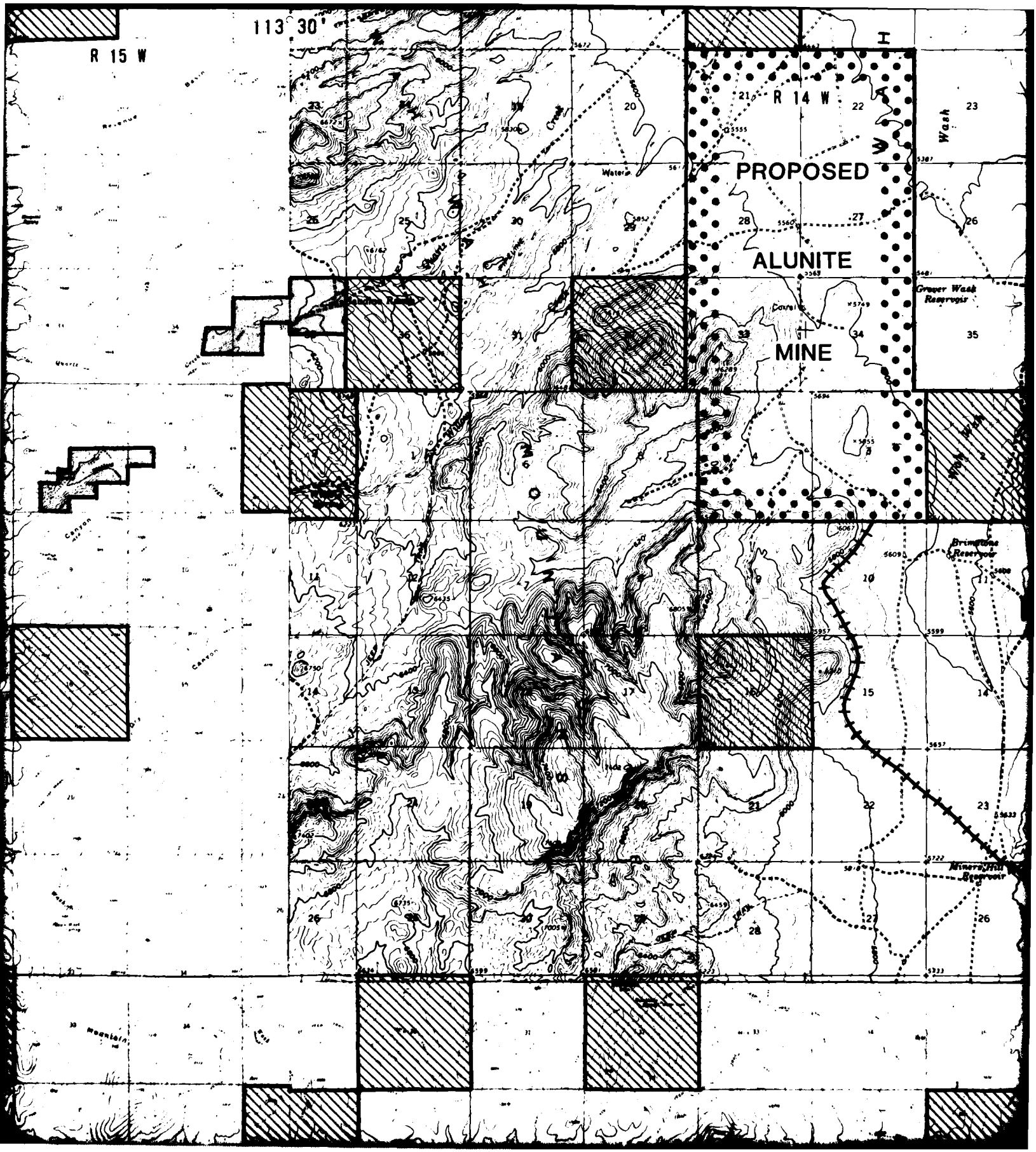
GEOTECHNICAL CONDITIONS
ESCALANTE DESERT, BERYL AREA, UTAH

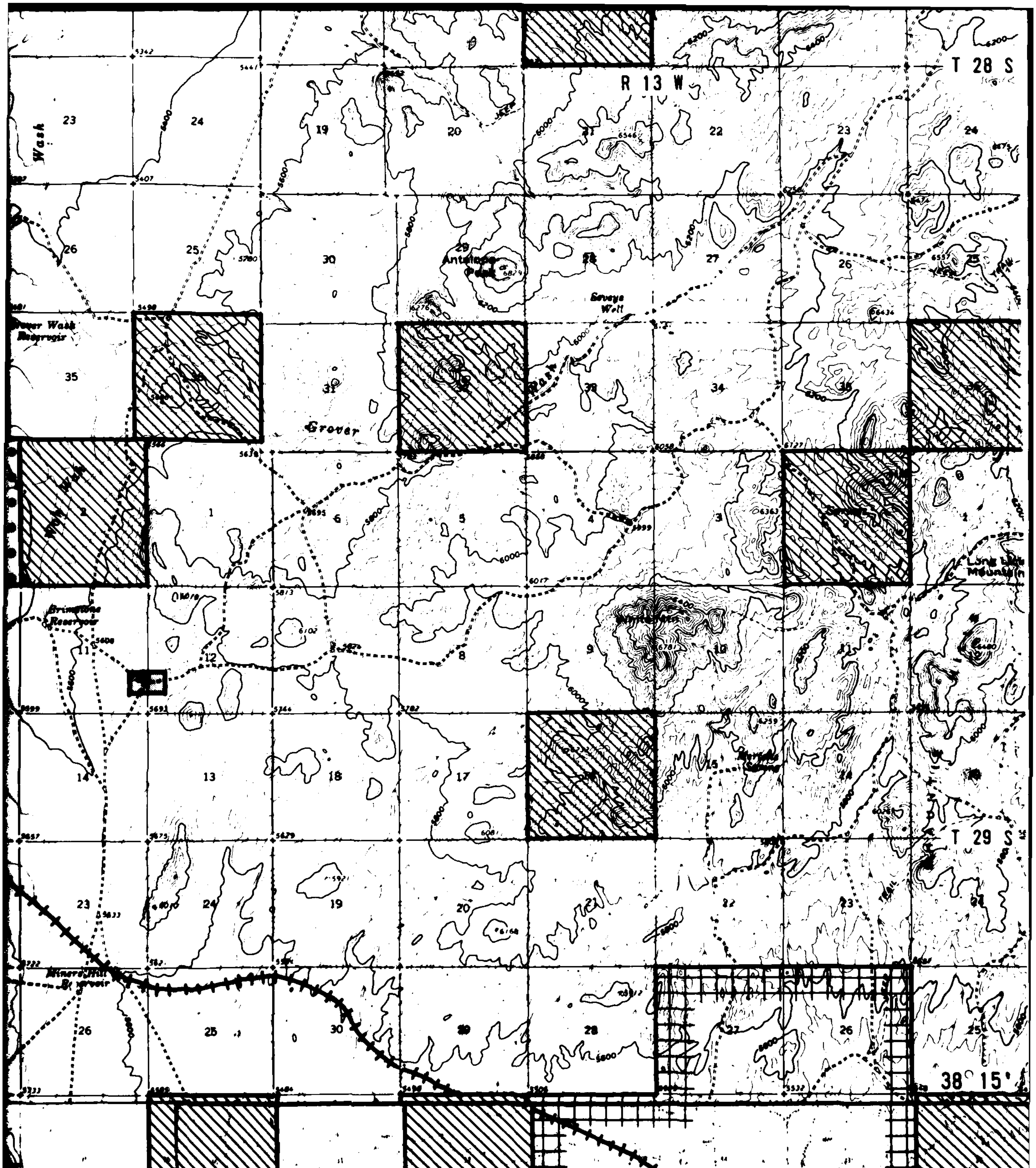
DRAWING


T 28 S
R 19 W
R 18 W
T 29 S
38° 15'

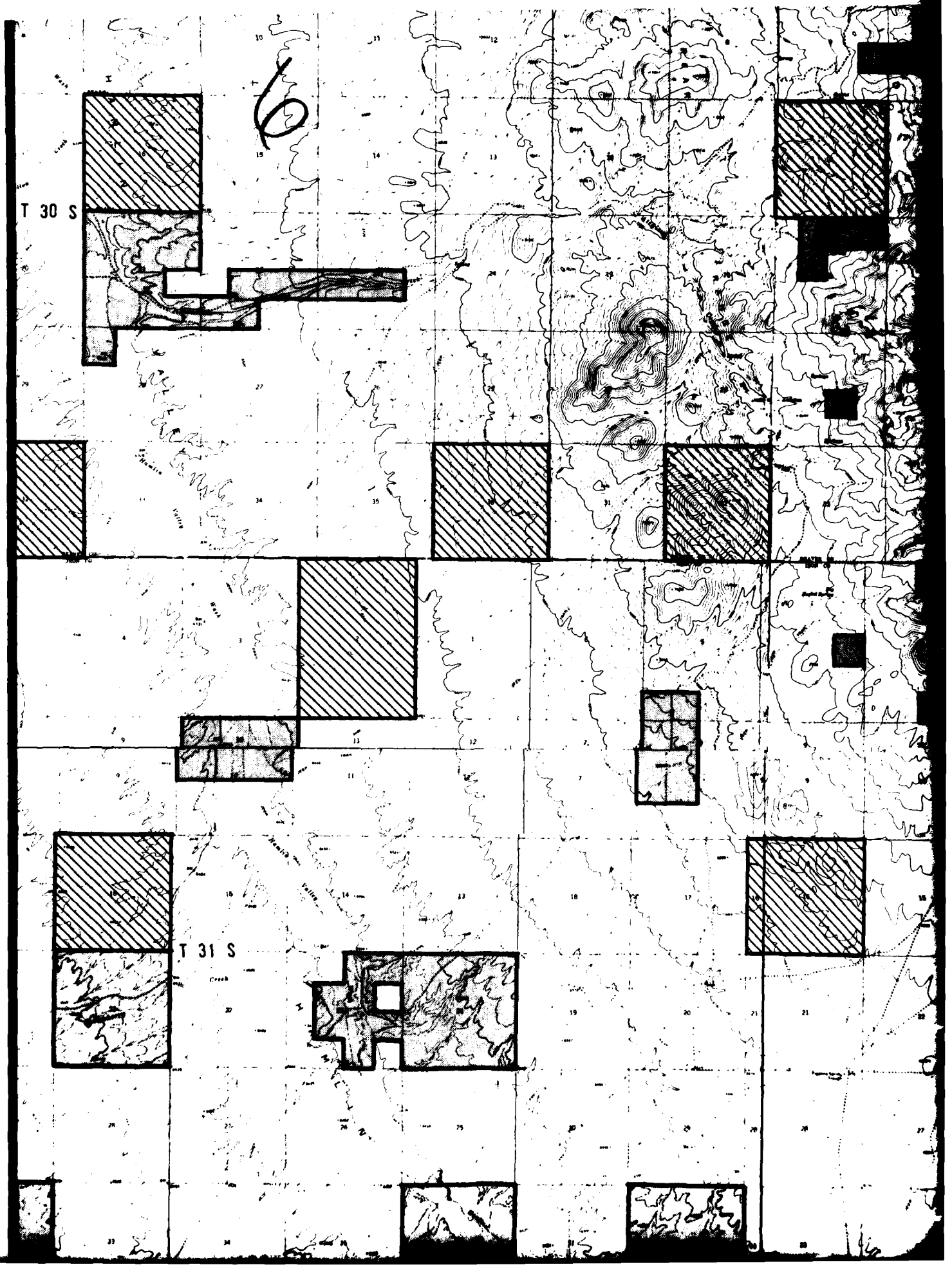

113 45'
R 17 W
TO DESIGN
DEPLOYMEN
INDIAN PEAK
WILDLIFE
MANAGEMENT
AREA
SECURITY
ALERT
FACILITY
BARRIER
CLUSTER MAINTENANCE

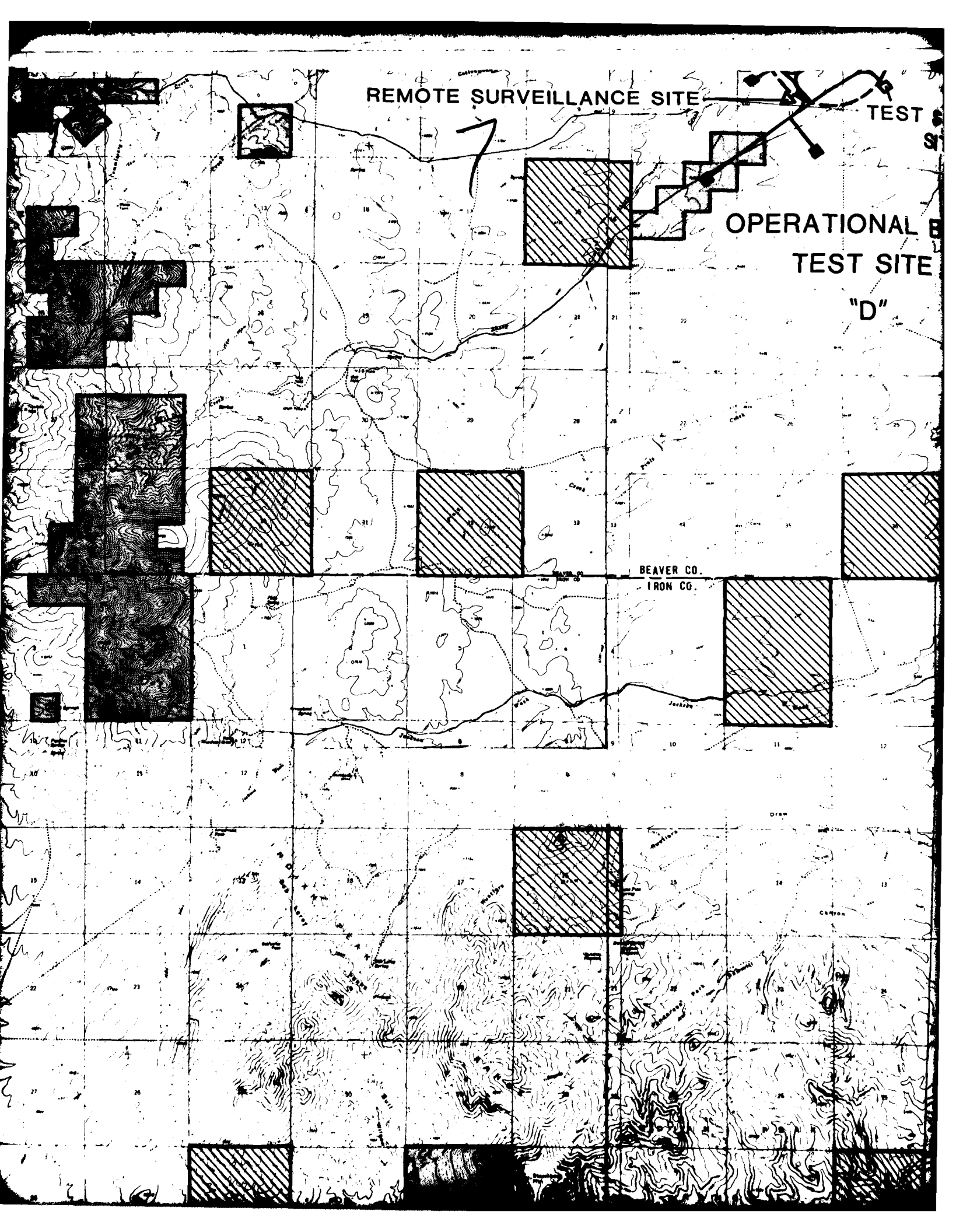

R 16 W
PINE GROVE
MOLYBDENUM PROJECT
SIGNATED
MENT AREA
DESIGNATED TRAN

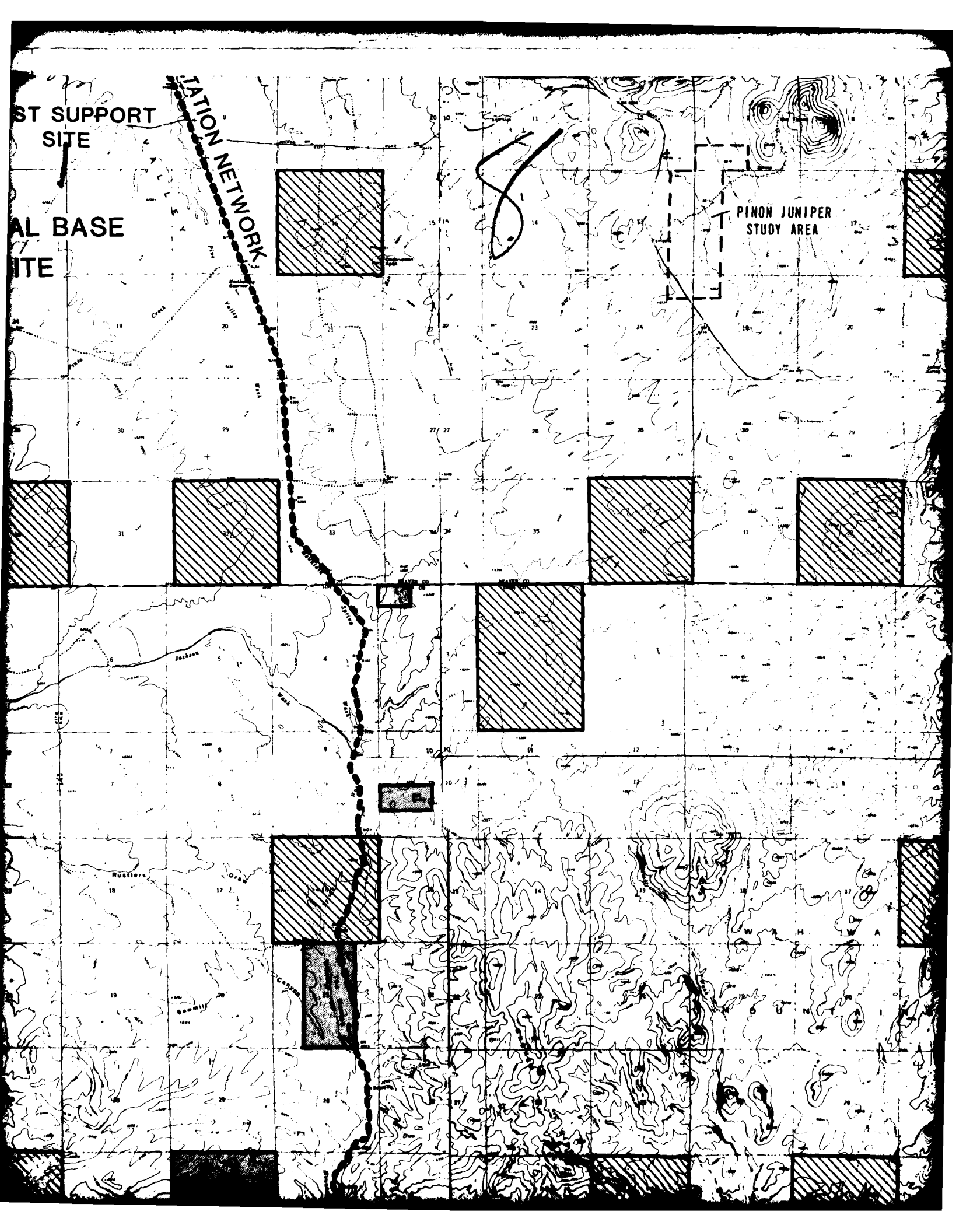

113° 30'
R 15 W
R 14 W
I
PROPOSED
ALUNITE
MINE
Grouse Wash Reservoir
Brimstone Reservoir
Mineral Hill Reservoir

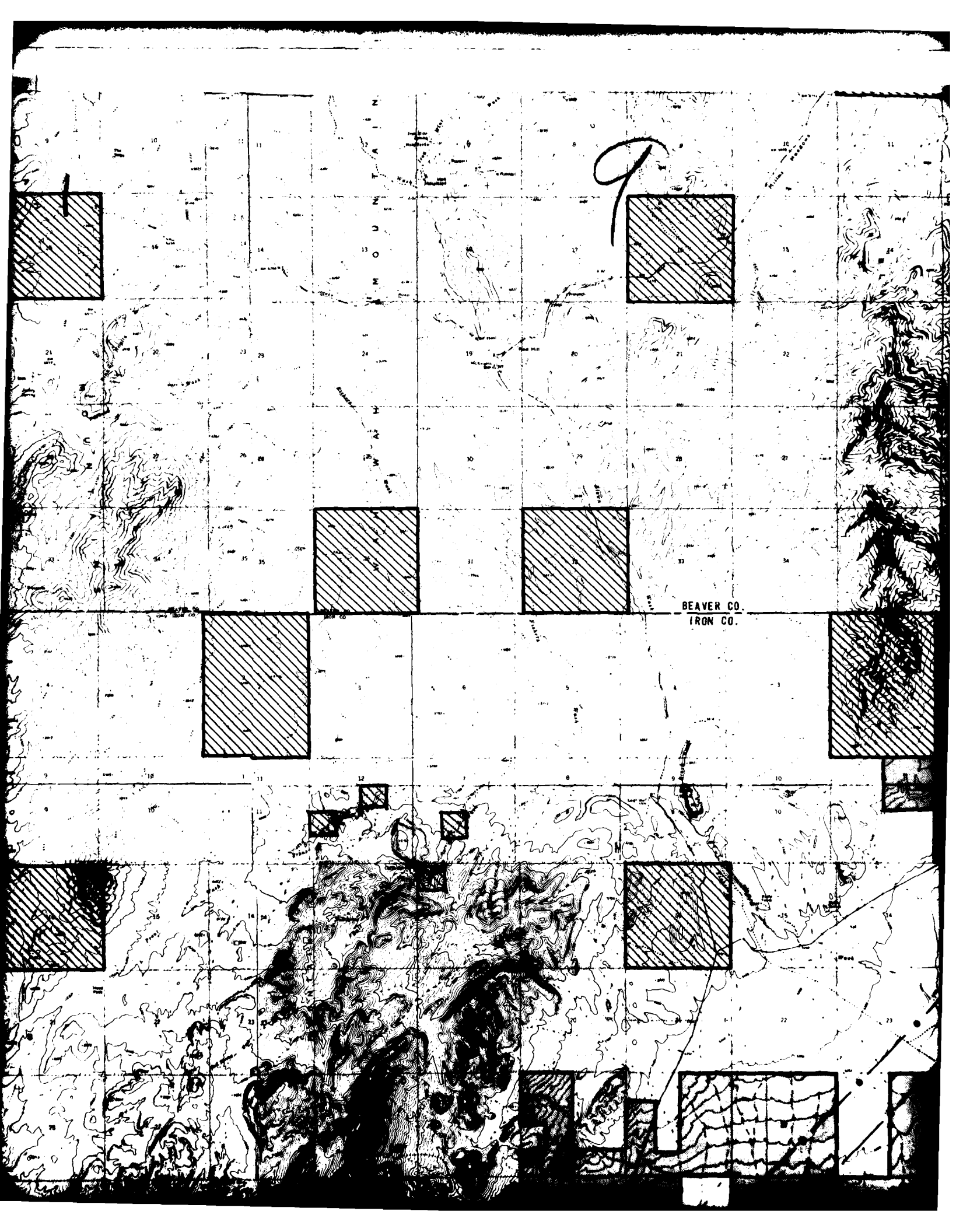


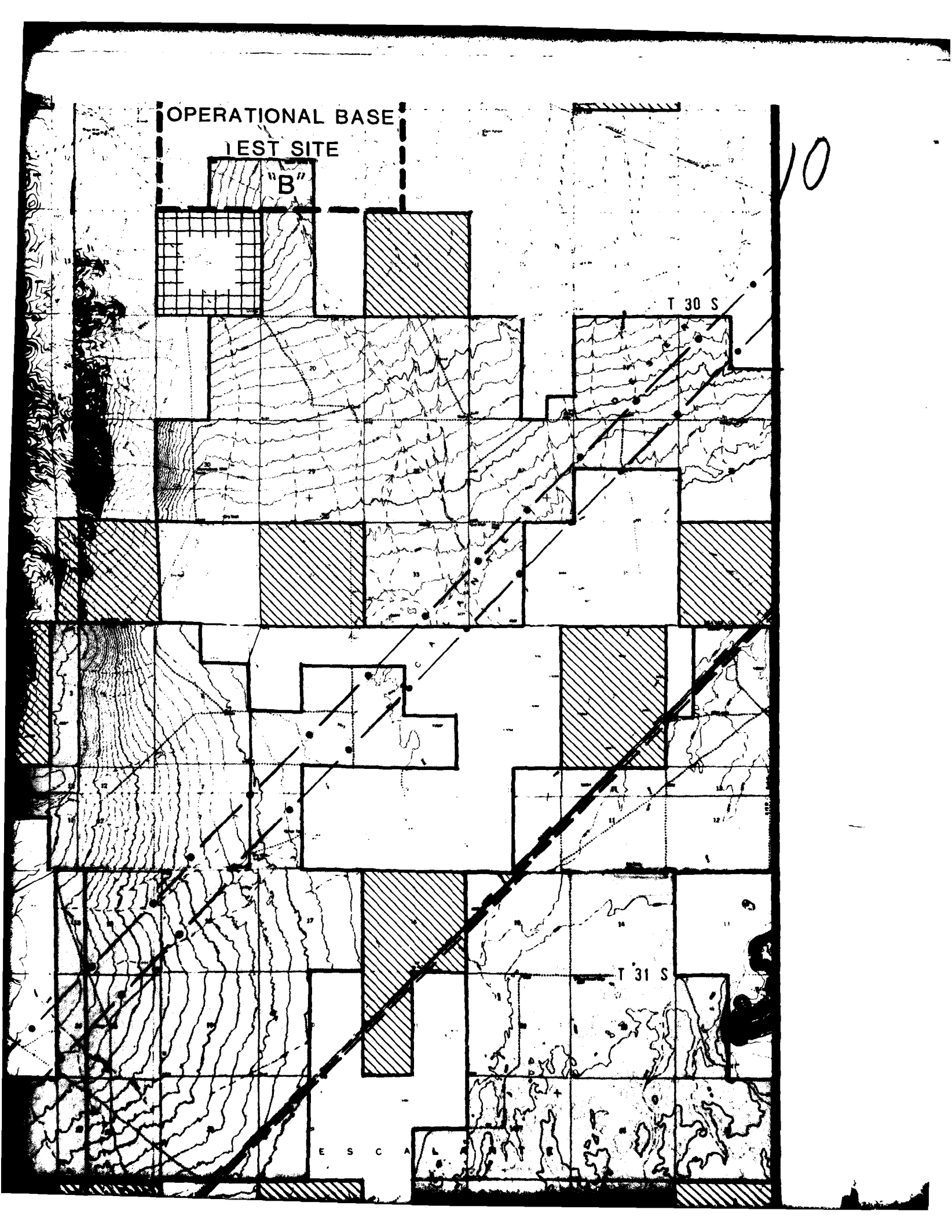
T 28 S
R 13 W
Wash
Antelope Peak
Seveys Well
Grover
Brimstone Reservoir
Long Lake Mountain
T 29 S
38° 15'

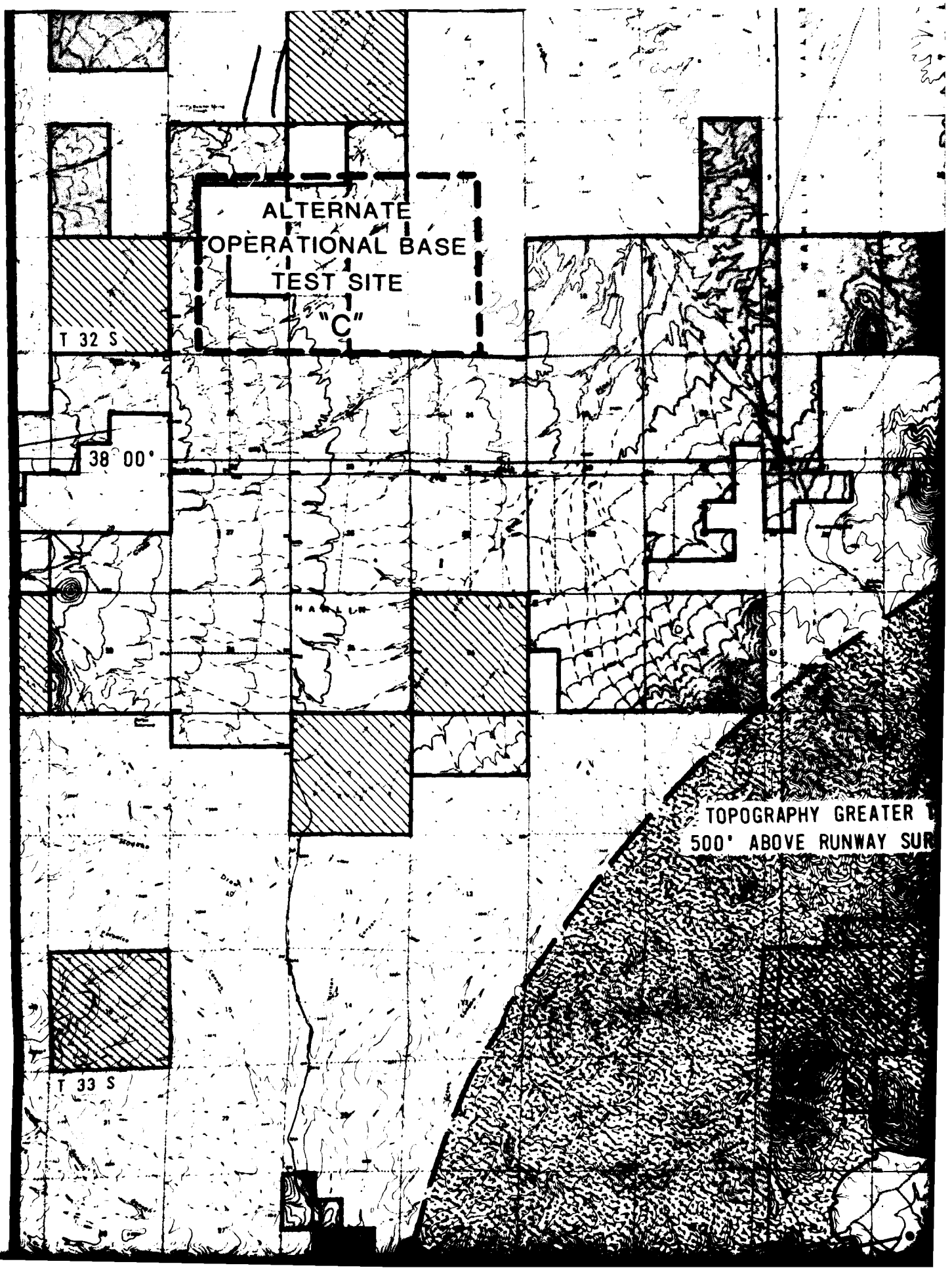

T 30 S
T 31 S

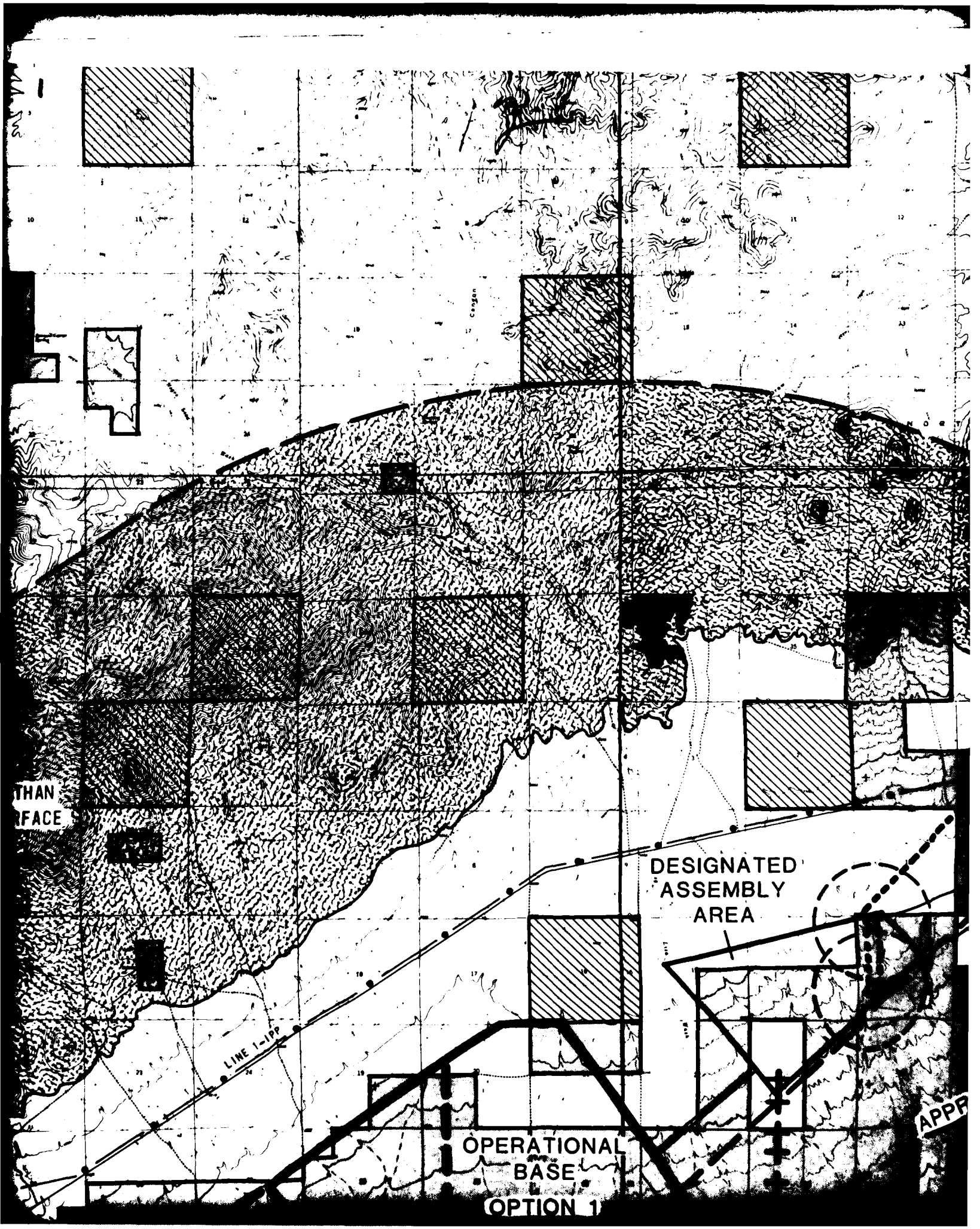

REMOTE SURVEILLANCE SITE
TEST
OPERATIONAL
TEST SITE
"D"
BEAVER CO.
IRON CO.

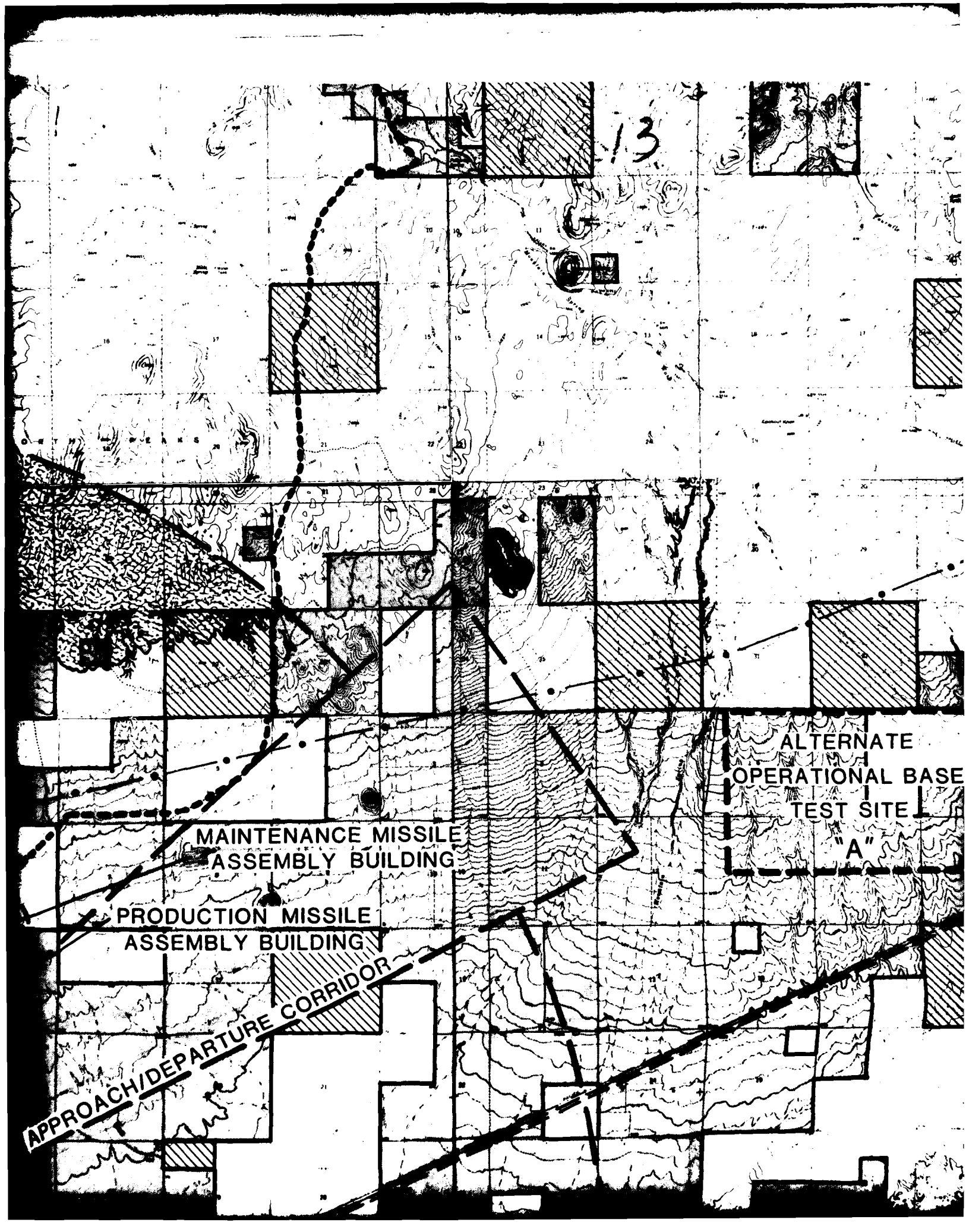

ST SUPPORT
SITE
AL BASE
ITE
ATION NETWORK
PINON JUNIPER
STUDY AREA

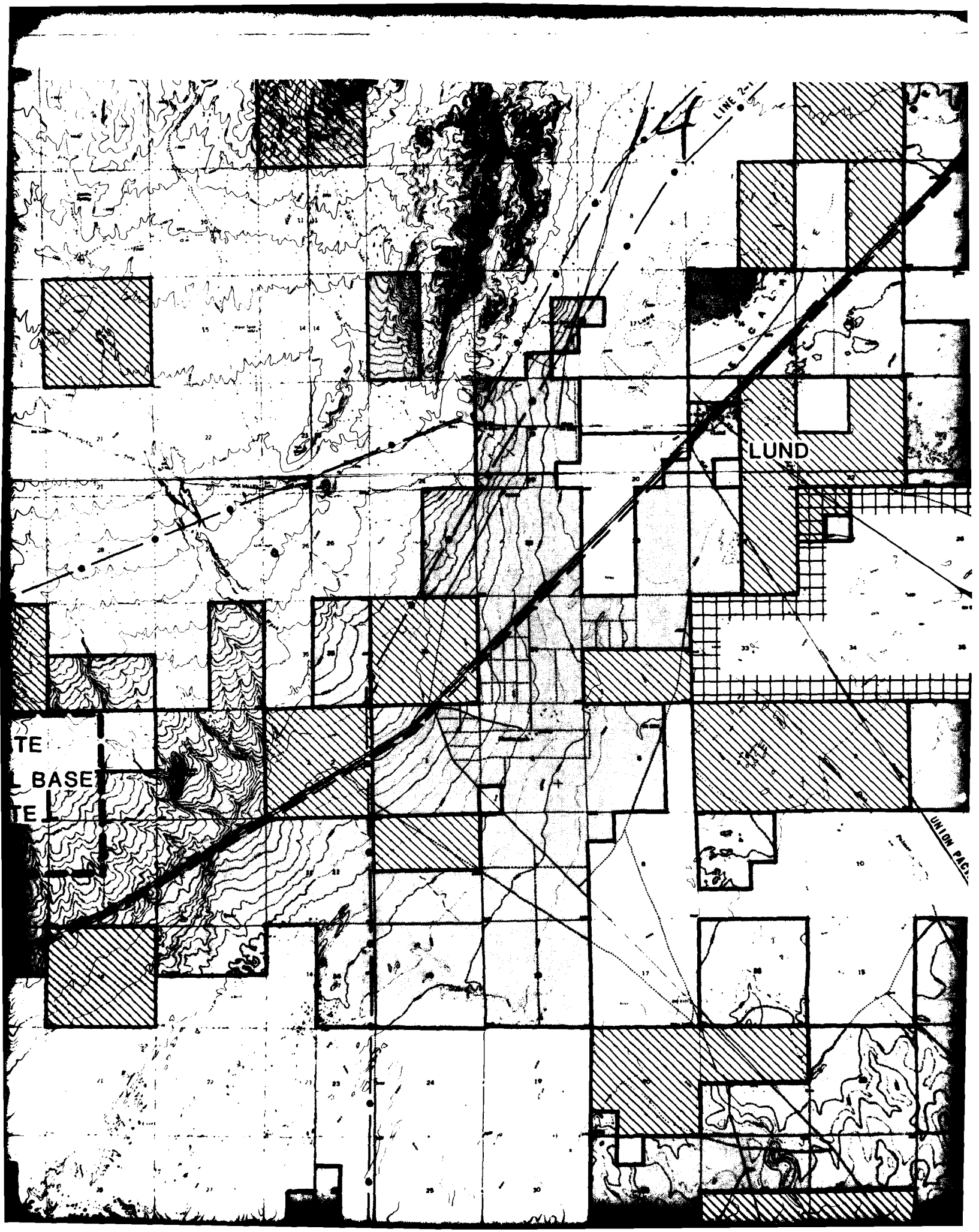

BEAVER CO.
IRON CO.

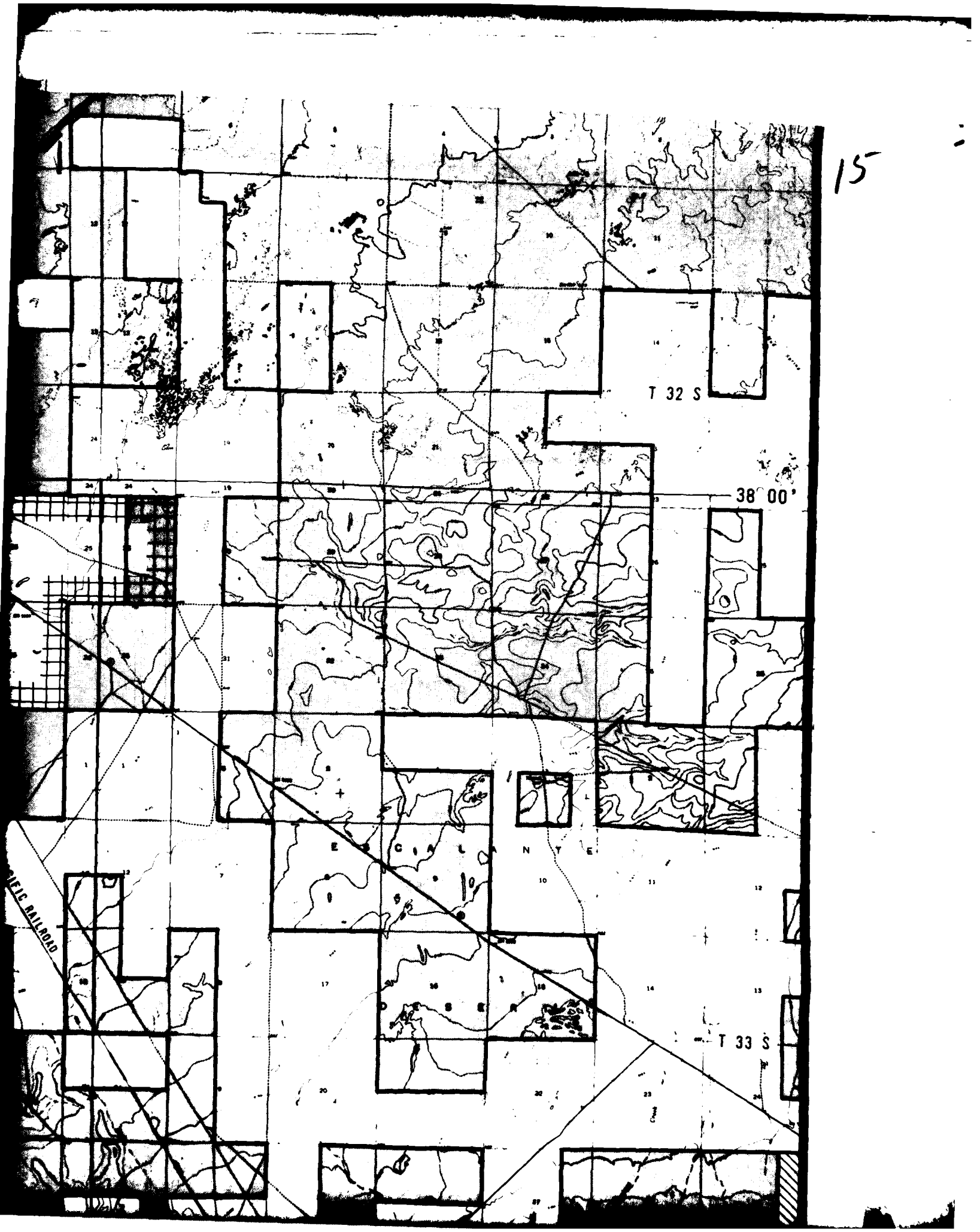

OPERATIONAL BASE
TEST SITE
"B"
T 30 S
T 31 S
E S C A L

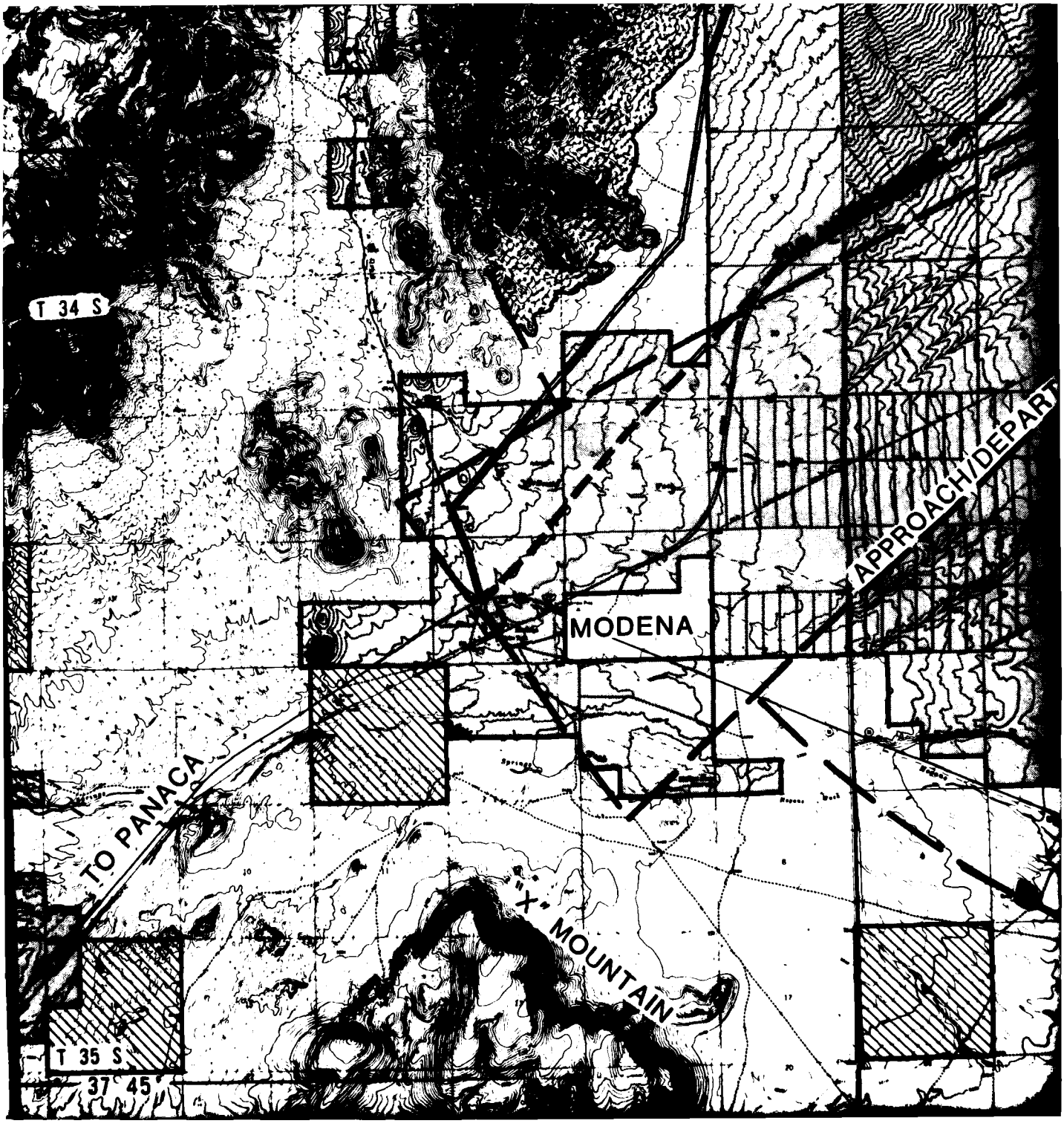

ALTERNATE
OPERATIONAL BASE
TEST SITE
"C"
T 32 S
38° 00'
T 33 S
TOPOGRAPHY GREATER
500' ABOVE RUNWAY SUR

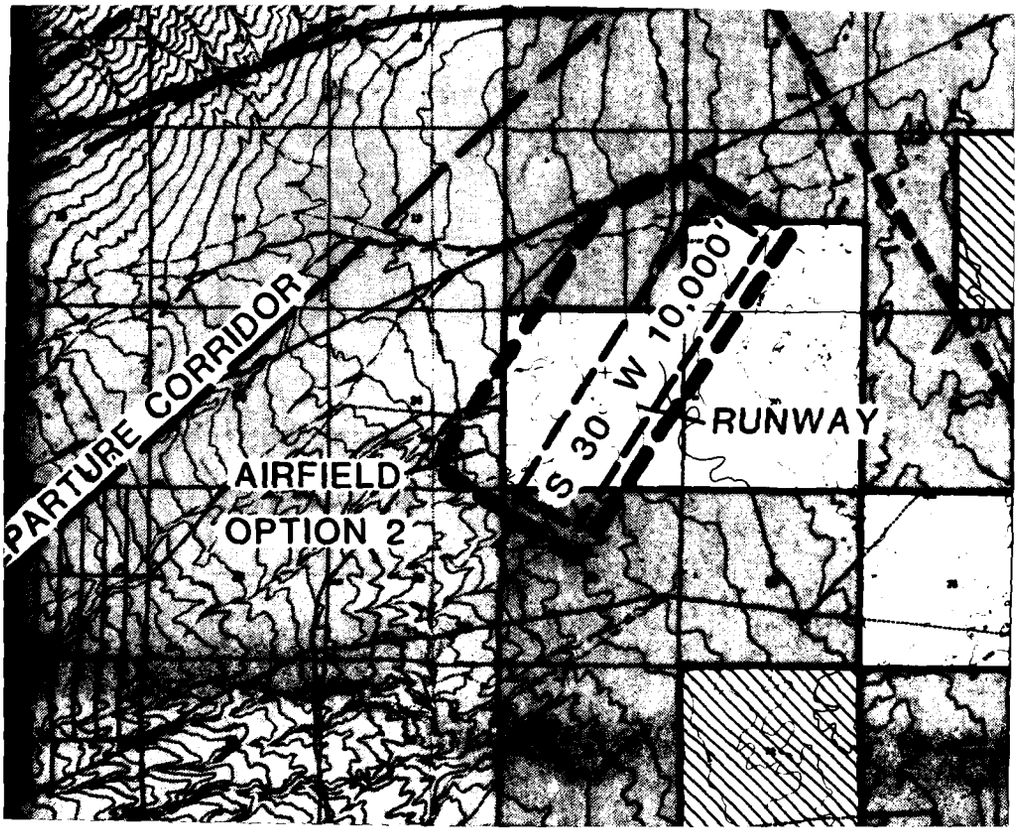

THAN
RFACE
DESIGNATED
ASSEMBLY
AREA
LINE 1-IPP
OPERATIONAL
BASE
OPTION 1
APPR

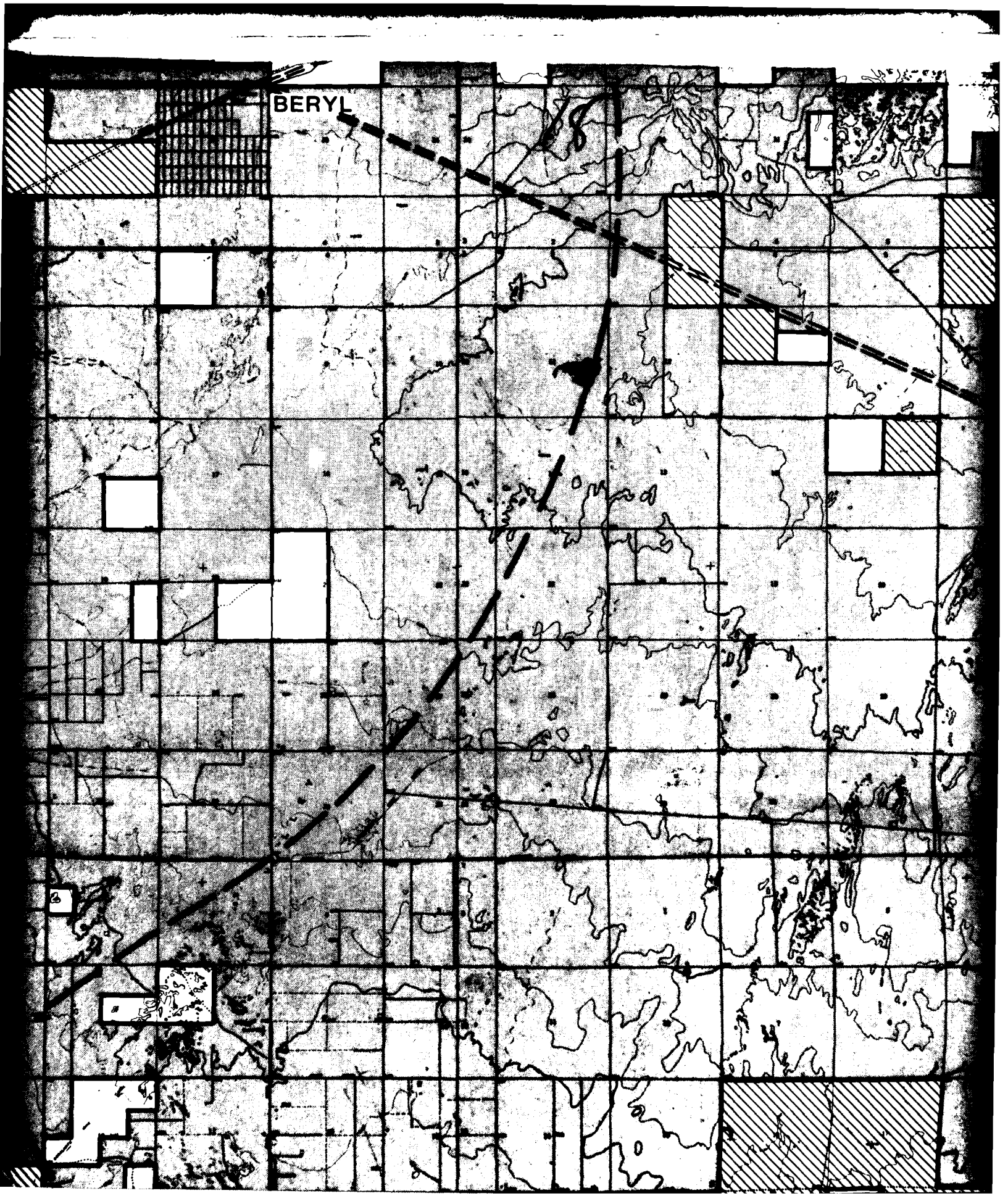

13
ALTERNATE
OPERATIONAL BASE
TEST SITE
"A"
MAINTENANCE MISSILE
ASSEMBLY BUILDING
PRODUCTION MISSILE
ASSEMBLY BUILDING
APPROACH/DEPARTURE CORRIDOR

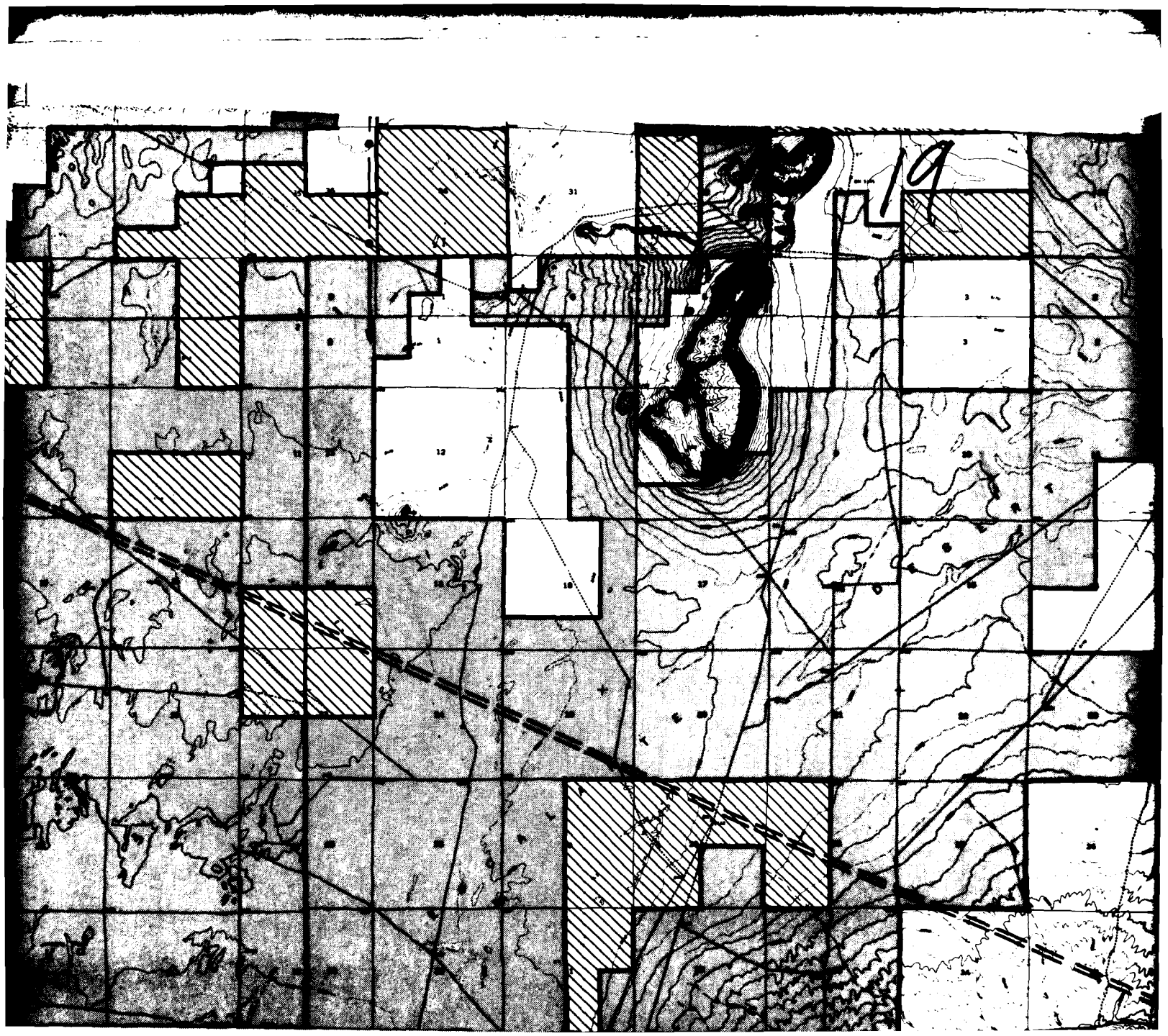

14
LINE 2-1
LUND
UNION PAC

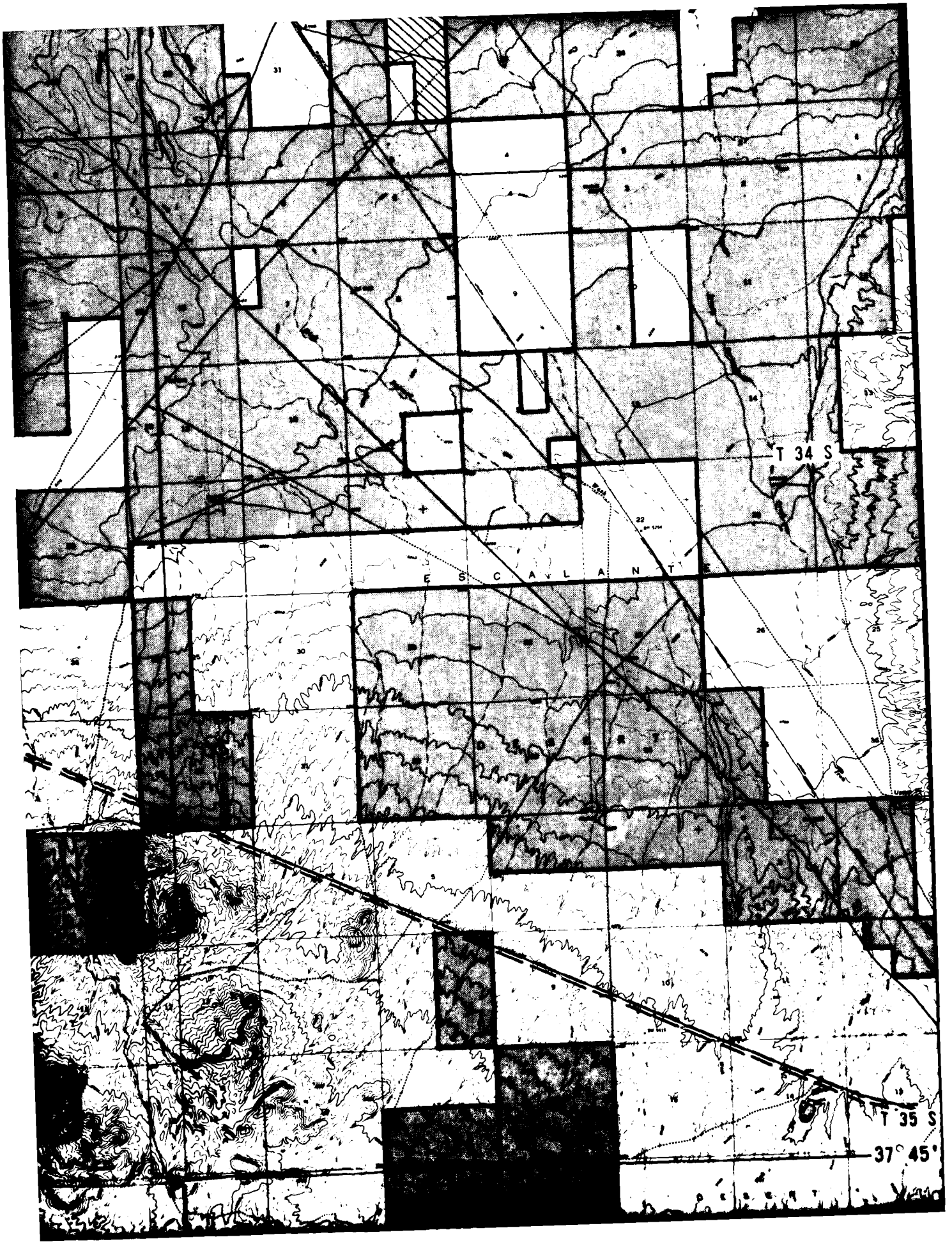

15
T 32 S
38° 00'
E C I A L A N T E
T 33 S

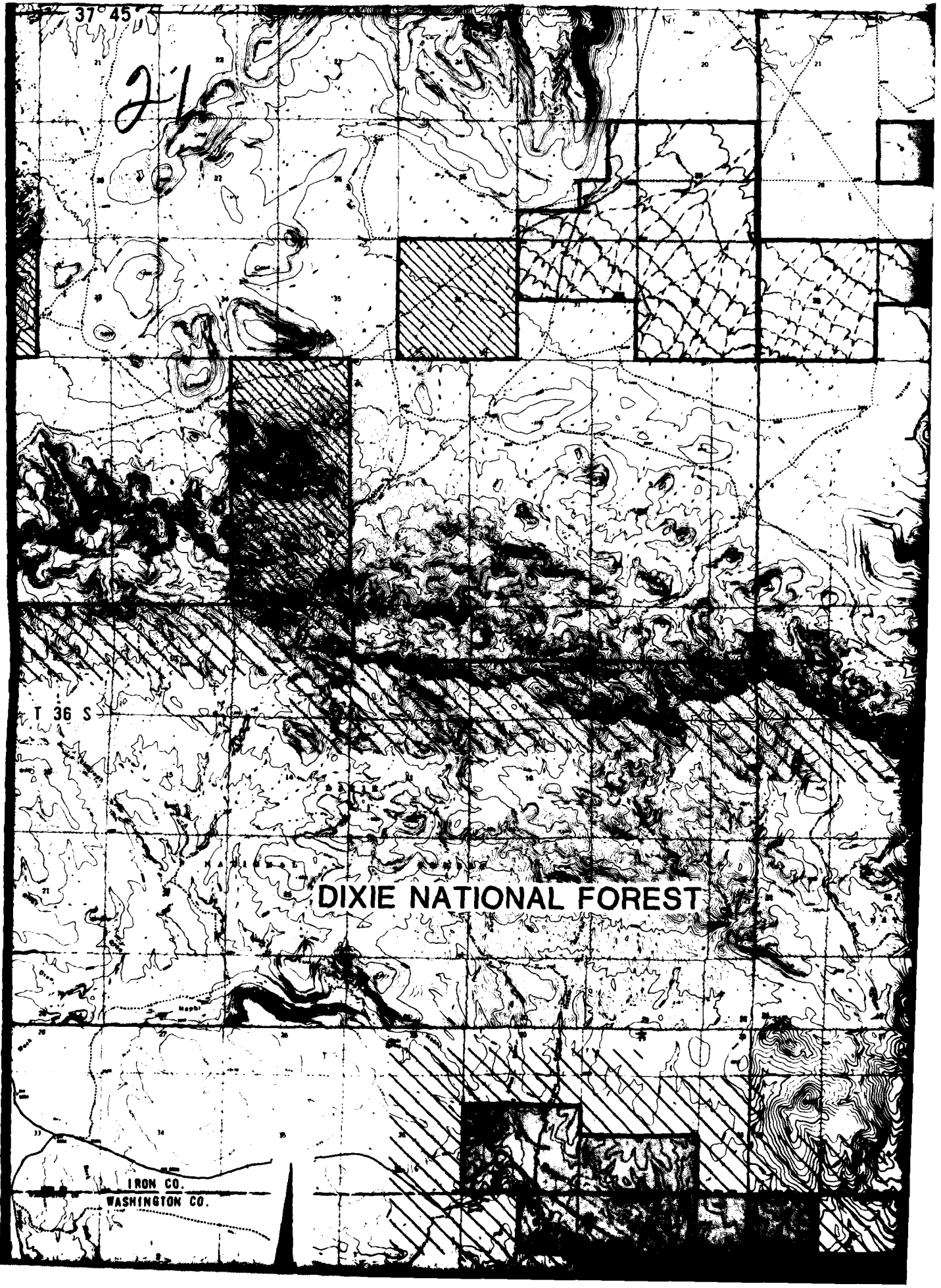

T 34 S
APPROACH/DEPART
MODENA
TO PANACA
MOUNTAIN
T 35 S
37 45

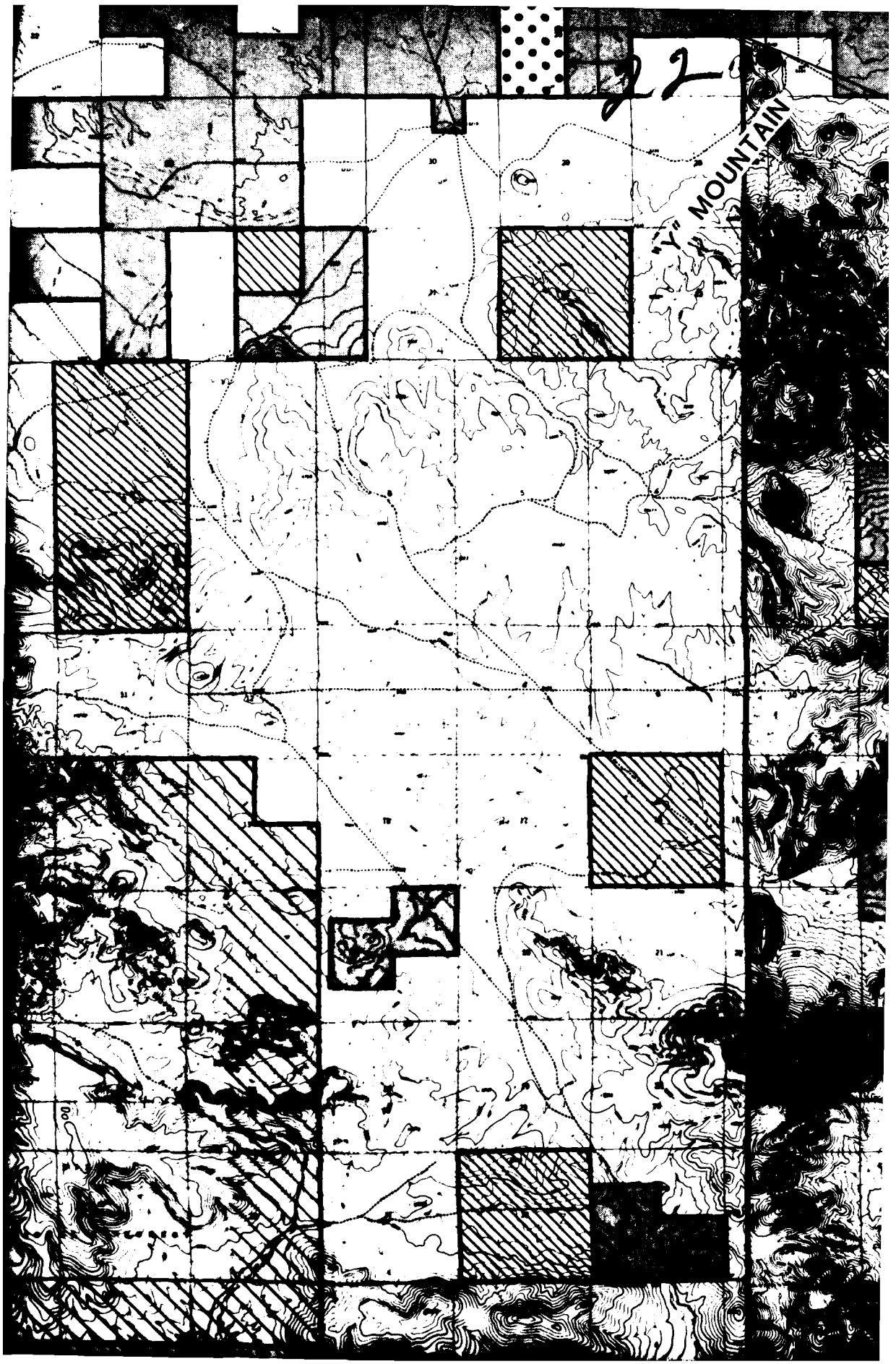

PARTURE CORRIDOR
AIRFIELD
OPTION 2
S 30 W 10,000'
RUNWAY

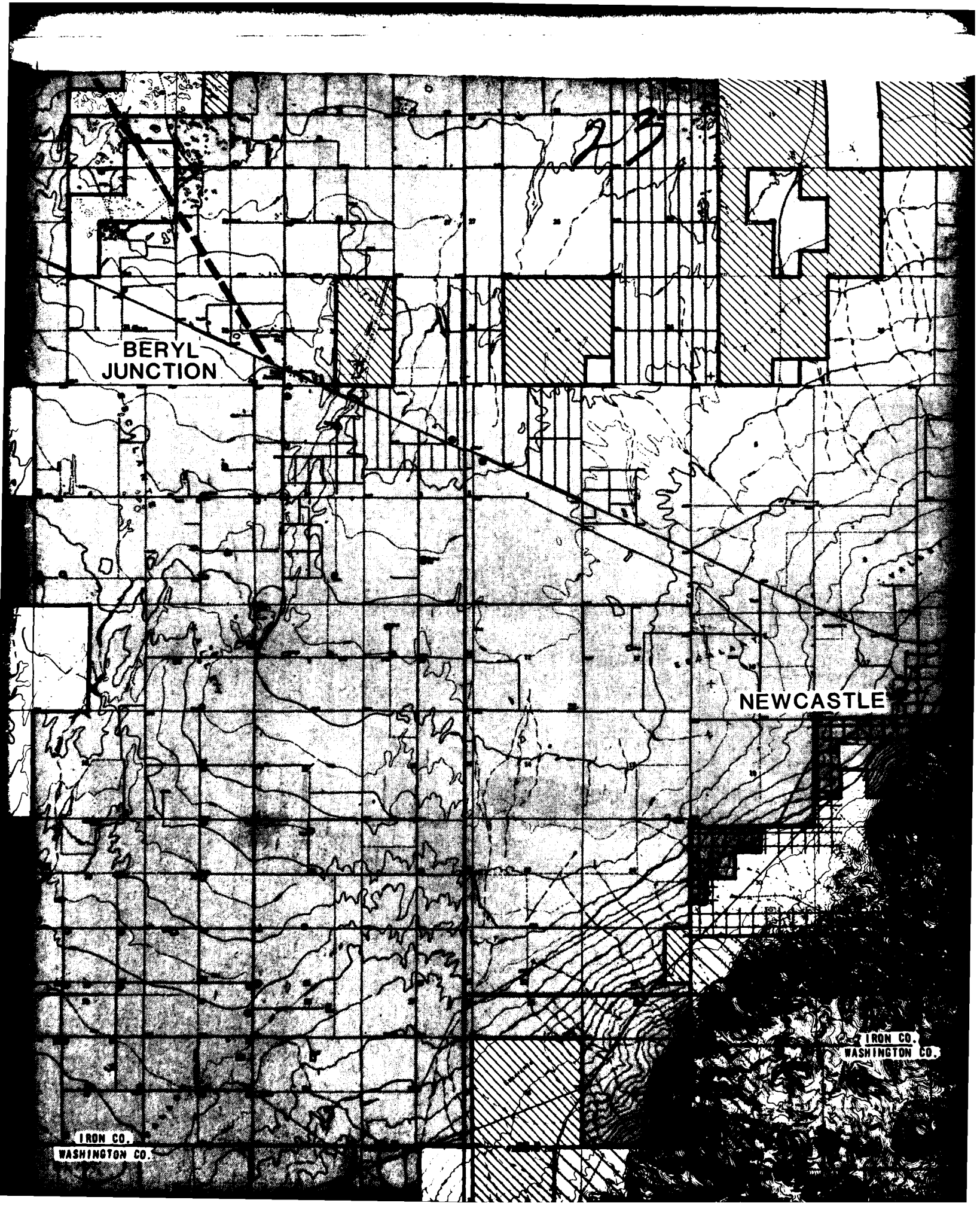

BERYL

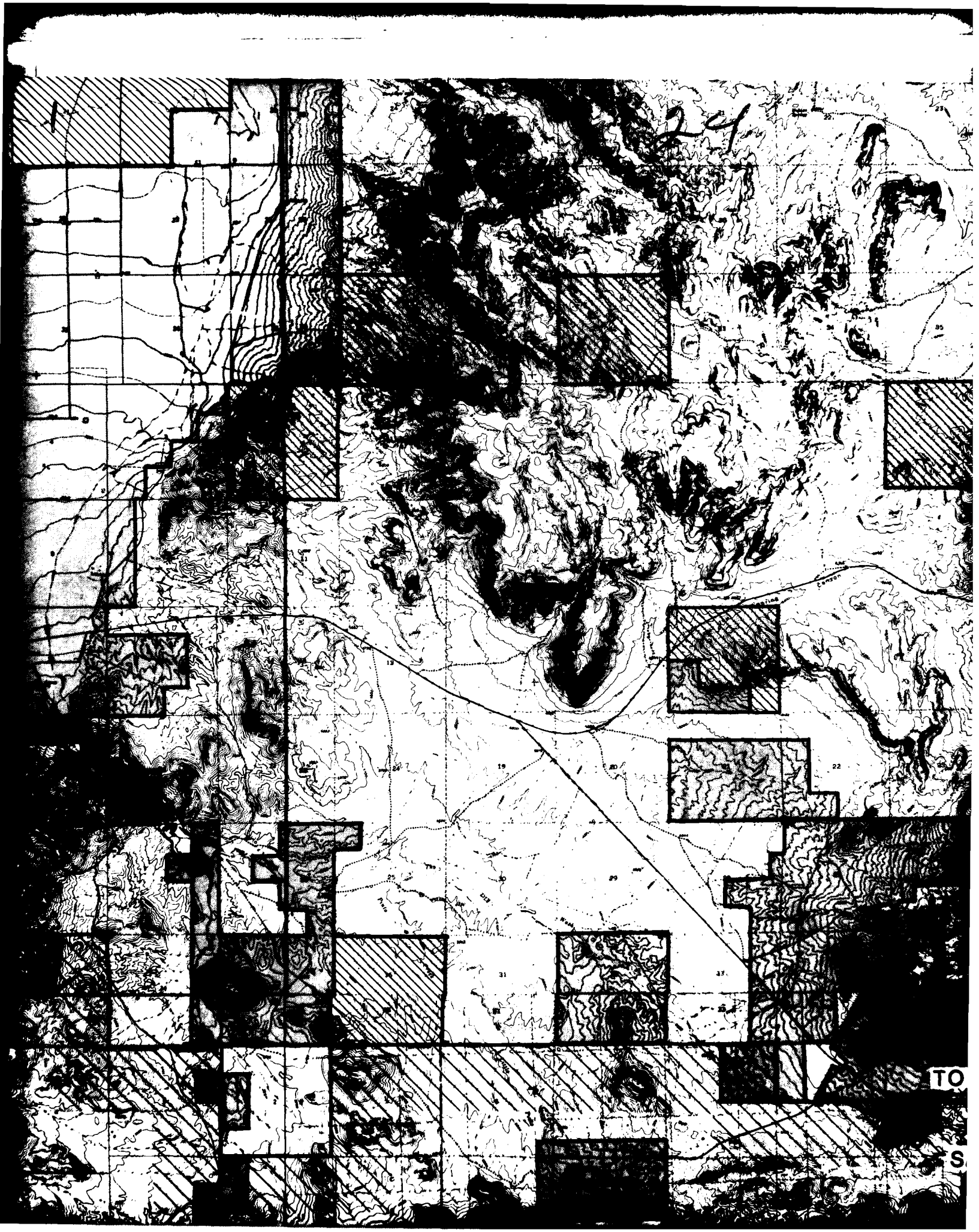

19

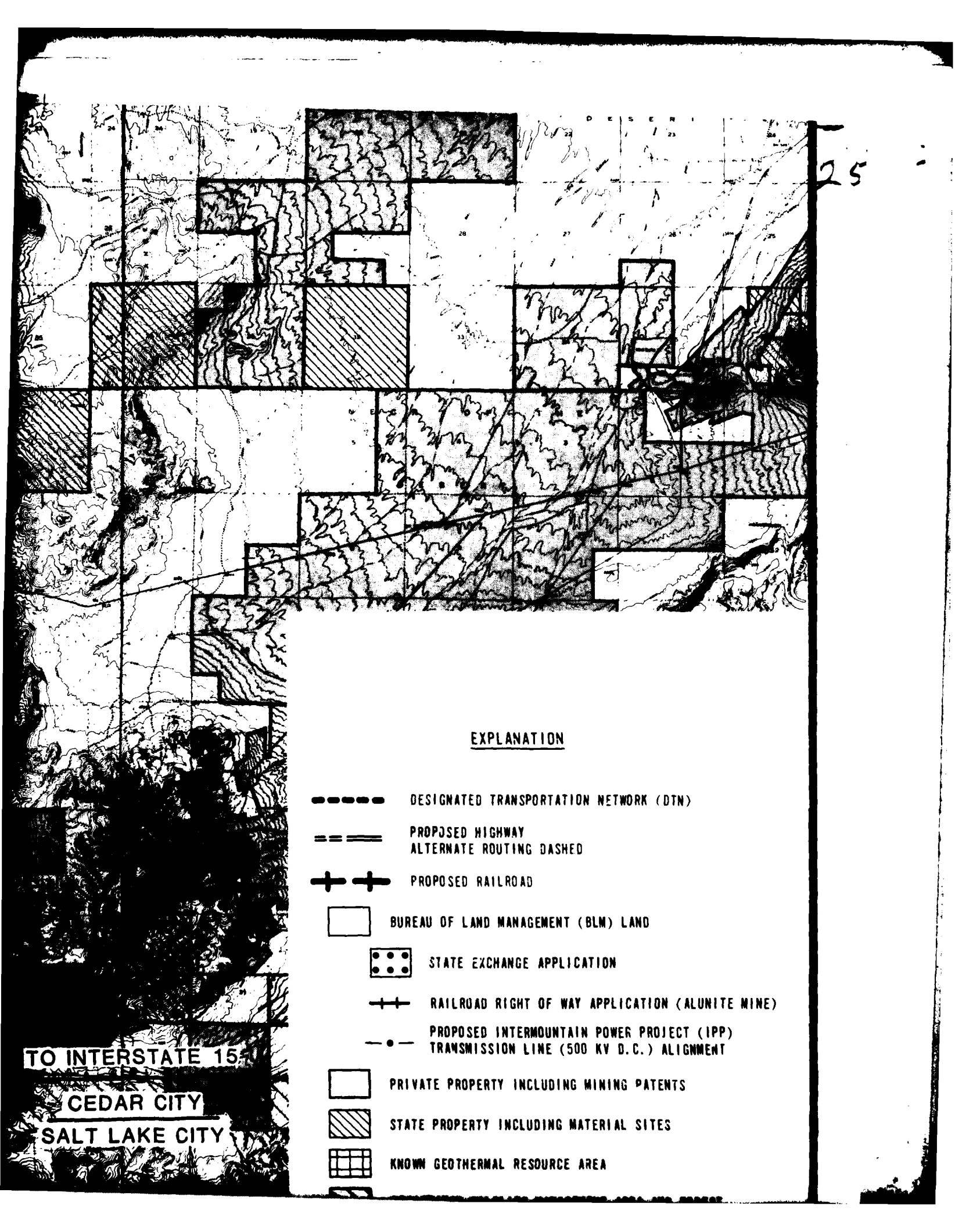

T 34 S
E S C A L A N T E
T 35 S
37° 45'

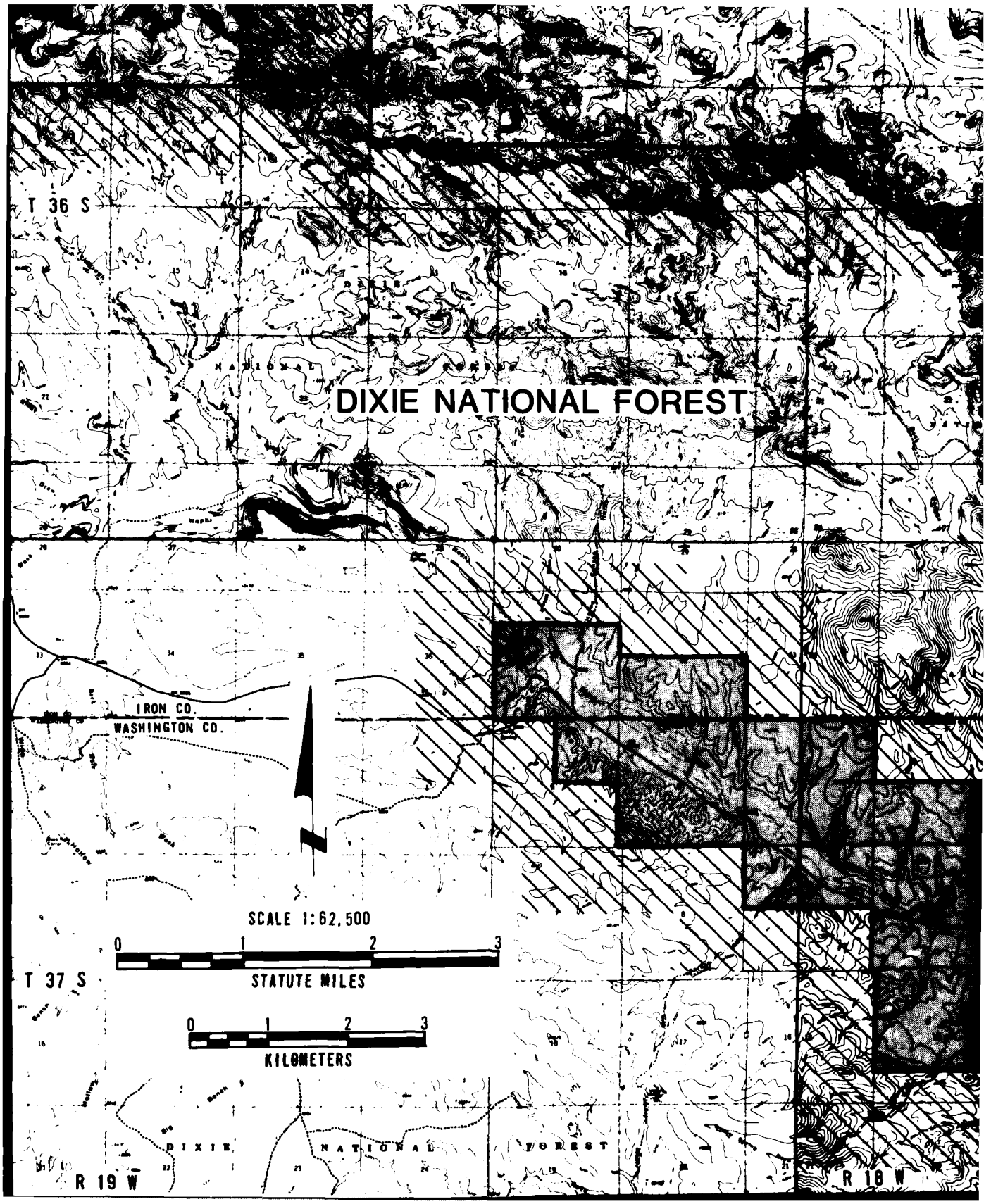

37° 45'
T 36 S
DIXIE NATIONAL FOREST
IRON CO.
WASHINGTON CO.

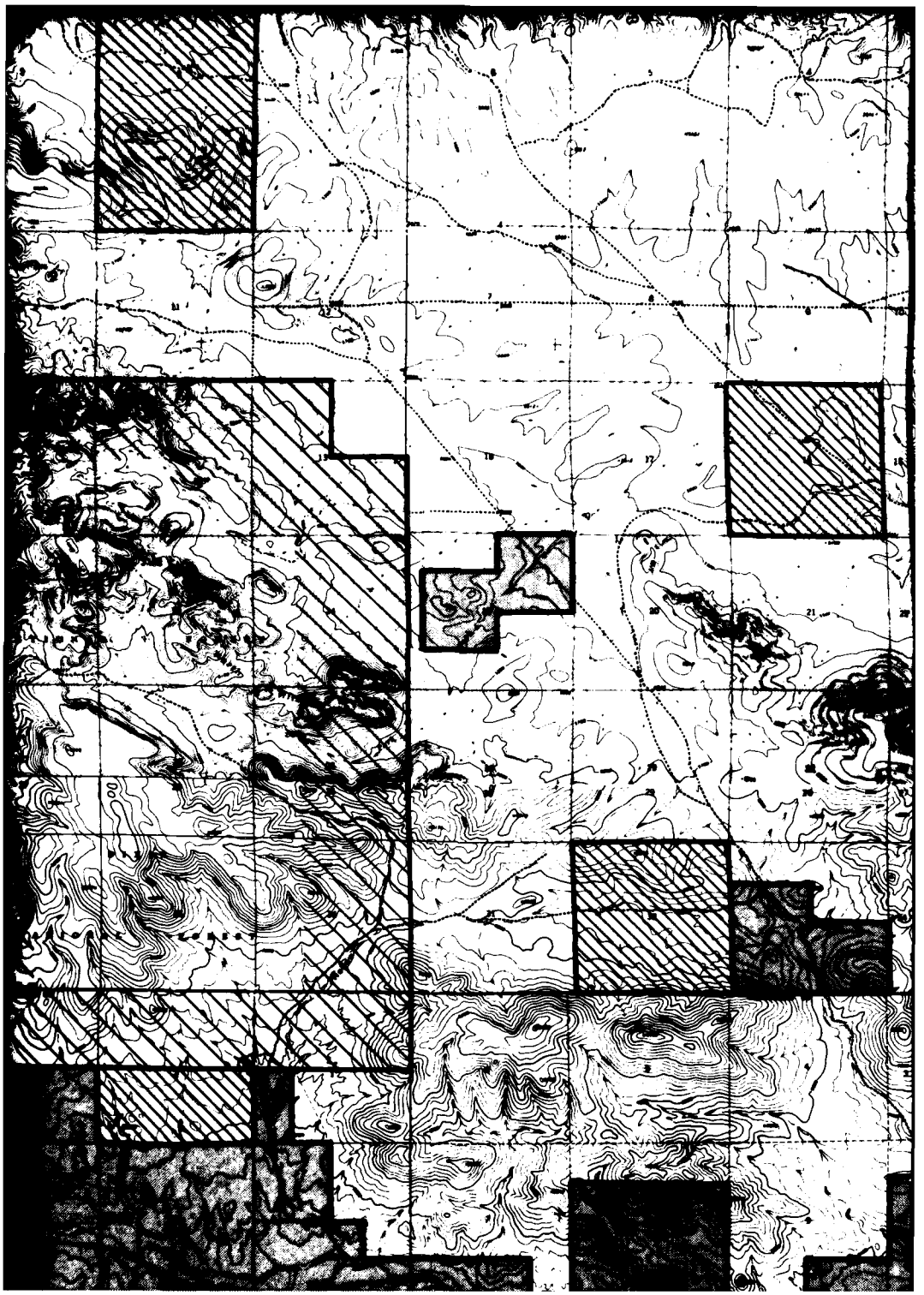

"Y" MOUNTAIN

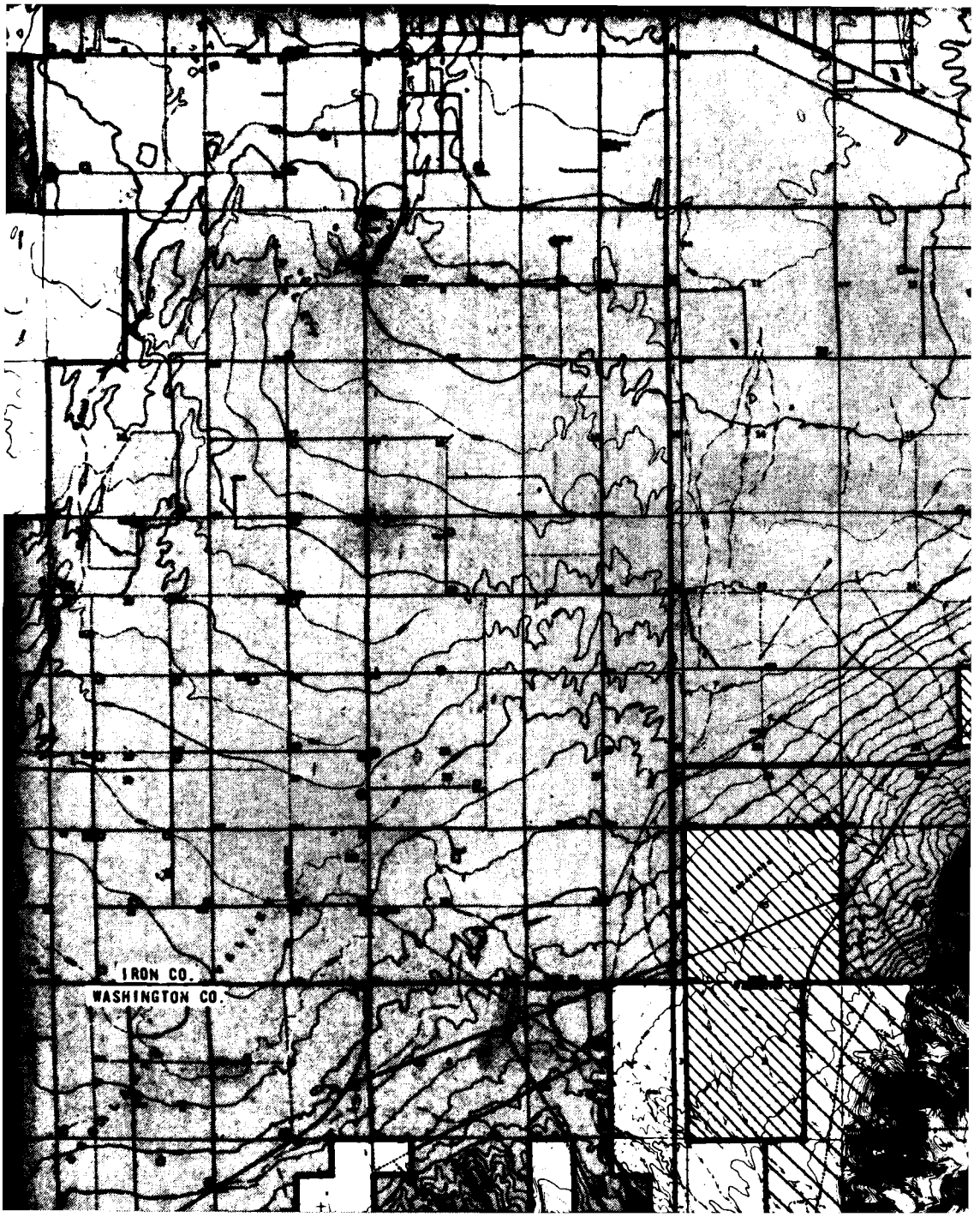

BERYL
JUNCTION
NEWCASTLE
IRON CO.
WASHINGTON CO.
IRON CO.
WASHINGTON CO.

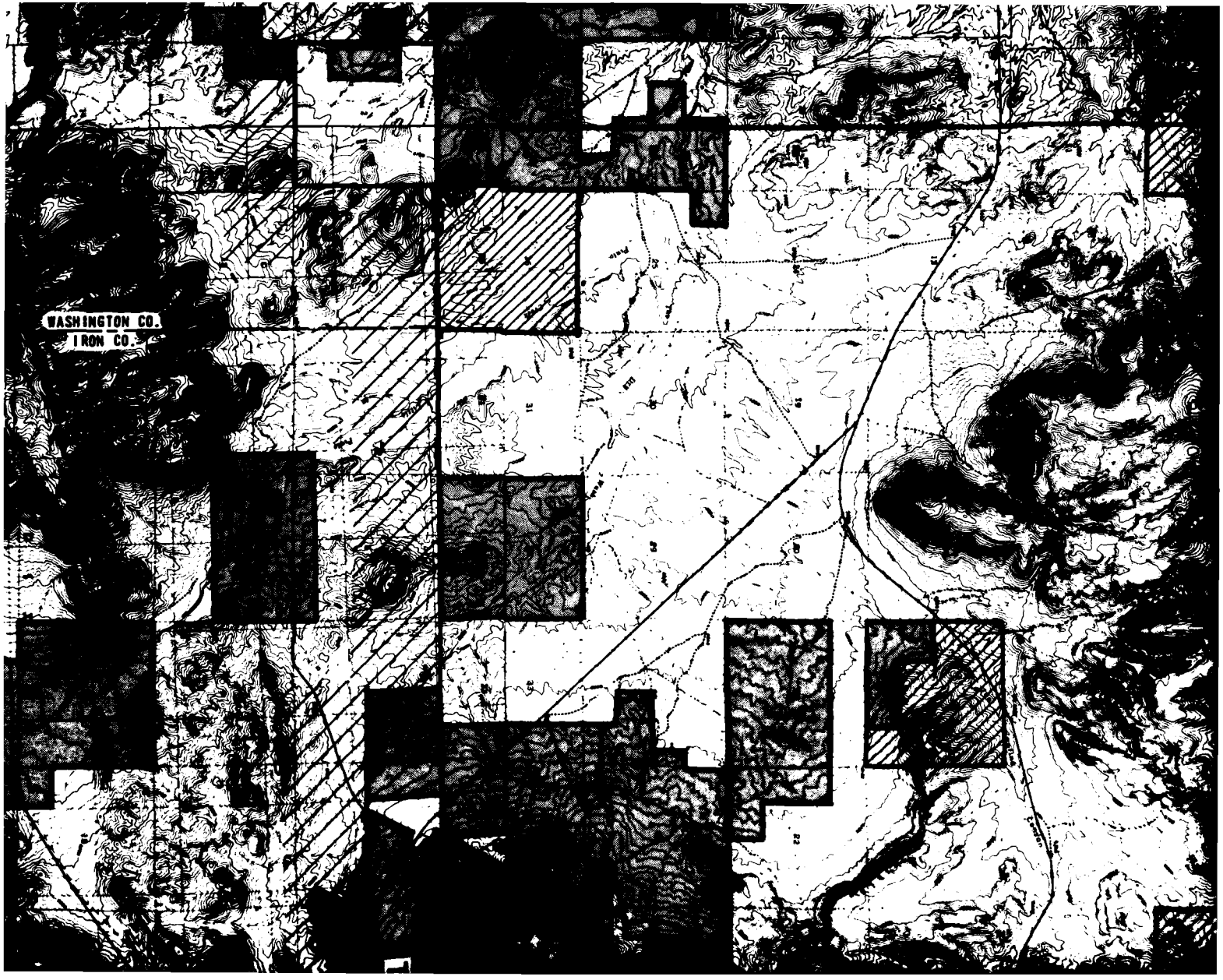

TO

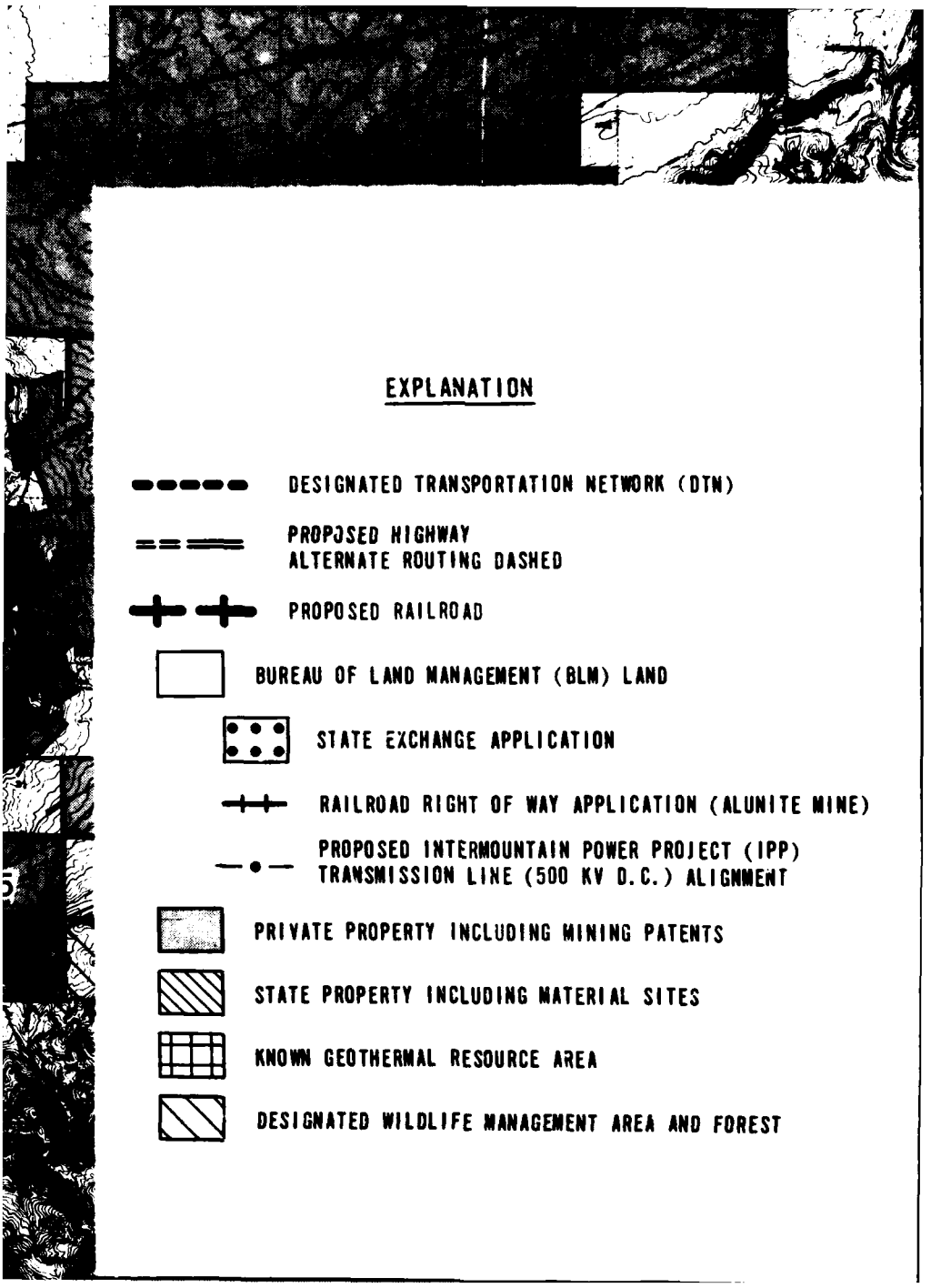

EXPLANATION
DESIGNATED TRANSPORTATION NETWORK (DTN)
PROPOSED HIGHWAY
ALTERNATE ROUTING DASHED
PROPOSED RAILROAD
BUREAU OF LAND MANAGEMENT (BLM) LAND
STATE EXCHANGE APPLICATION
RAILROAD RIGHT OF WAY APPLICATION (ALUNITE MINE)
PROPOSED INTERMOUNTAIN POWER PROJECT (IPP)
TRANSMISSION LINE (500 KV D.C.) ALIGNMENT
PRIVATE PROPERTY INCLUDING MINING PATENTS
STATE PROPERTY INCLUDING MATERIAL SITES
KNOWN GEOTHERMAL RESOURCE AREA
TO INTERSTATE 15
CEDAR CITY
SALT LAKE CITY


T 36 S
DIXIE NATIONAL FOREST
IRON CO.
WASHINGTON CO.
SCALE 1:62,500
0 1 2 3
STATUTE MILES
T 37 S
0 1 2 3
KILOMETERS
DIXIE NATIONAL FOREST
R 19 W
R 18 W




IRON CO.
WASHINGTON CO.


WASHINGTON CO.
IRON CO.



EXPLANATION

DESIGNATED TRANSPORTATION NETWORK (DTN)

PROPOSED HIGHWAY
ALTERNATE ROUTING DASHED

PROPOSED RAILROAD

BUREAU OF LAND MANAGEMENT (BLM) LAND

STATE EXCHANGE APPLICATION

RAILROAD RIGHT OF WAY APPLICATION (ALUNITE MINE)

PROPOSED INTERMOUNTAIN POWER PROJECT (IPP)
TRANSMISSION LINE (500 KV D.C.) ALIGNMENT

PRIVATE PROPERTY INCLUDING MINING PATENTS

STATE PROPERTY INCLUDING MATERIAL SITES

KNOWN GEOTHERMAL RESOURCE AREA

DESIGNATED WILDLIFE MANAGEMENT AREA AND FOREST